Economic Evaluation of Inland Fisheries

Module B: Indirect Economic Values Associated with Fisheries

Research and Development

Project Record
W2-039/PR/2

ENVIRONMENT AGENCY

Economic Evaluation of Inland Fisheries
Module B: Indirect Economic Values Associated with Fisheries

R&D Project Record W2-039/PR/2

Module B: J Spurgeon[1], G Colarullo[1], A F Radford[2] and D Tingley[3]

Research Contractor:
1: GIBB Ltd
GIBB House, London Road, Reading Berkshire RG6 1BL

2: Division of Economics and Enterprise,
Glasgow Caledonian University, Glasgow G4 0BA

3: MacAlister Elliot Partners,
56 High Street, Lymington, Hampshire SO41 9AH

Publishing Organisation
Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury,
BRISTOL, BS32 4UD.

Tel: 01454 624400 Fax: 01454 6244
Website: www.environment-agency.gov.uk

ISBN 185705 540 3

Dissemination Status
Internal: Released to Regions
External: Released to Public Domain

Statement of Use
This report summarises the findings of research carried out as part of an economic evaluation of inland recreational fisheries in England and Wales. Indirect economic values associated with fisheries were examined in this Module B. The information within this document is for use by Environment Agency staff and others involved in the management of inland fisheries.

Keywords
Bequest value, contingent valuation, consumers' surplus, economic value, existence value, option value, non-use value, recreational fishing, travel cost method.

Research Contractor
This document was produced under R&D Project W2-039 by:
MacAlister Elliott & Partners, 56 High Street, Lymington, Hampshire SO41 9AH

Tel: 01590 679016 Fax: 01590 671573 Email: mep@macalister-elliott.com
Website: http://www.macalister-elliott.com

Environment Agency's Project Leader
The Environment Agency's Project Leader for Project W2-039 was:
Dr Phil Hickley, National Coarse Fisheries Centre

Further copies of this report are available from:
Environment Agency R&D Dissemination Centre,
WRc, Frankland Road, Swindon, Wilts SN5 8YF

tel: 01793-865138 fax: 01793-514562 e-mail: publications@wrcplc.co.uk

R&D PROJECT RECORD W2-039/PR/2

FOREWARD

This Project Record for Module B (*Indirect Economic Values Associated with Fisheries*) of the Environment Agency's *Economic Evaluation of Inland Fisheries* R&D Programme provides additional information to that found in the associated R&D Technical Report W2-039/TR/1, which covers both Module A and B.

This Module B Project Record details all work undertaken during the course of the project, including background information, the specific objectives and the research agenda associated with each, full details of survey work, statistical analysis, detailed conclusions and a series of appendices which contain questionnaires used in the surveys and results from the econometric modelling of the value of individual fisheries.

ACKNOWLEDGEMENTS

The Project Team would like to thank the Environment Agency Project Board for their support and assistance in providing relevant information for this study. In addition, we would like to thank Dominic Moran and Paul McMahon for their comments on the contingent valuation questionnaires, and Brett Day and Peter Moffat for their useful comments on the econometric analysis.

The survey questionnaires were developed with assistance from Infrateste Burke who carried out the pilot and main national surveys and collated the results.

Valuable technical review, steerage and assistance was provided by the Project Team, and in particular Prof. David Pearce, environmental economist at University College London, Dr. David Solomon, independent freshwater fisheries expert, and Nigel Widgery of GIBB Ltd.

CONTENTS

FIGURES

Section 2

Section 5

Section 6

TABLES

Section 2-4

Section 5

Section 6

Section 7

GLOSSARY

Benefit-Cost Analysis: An analysis which seeks to compare welfare costs and benefits resulting from various action.

Bequest Values: Willingness to pay to preserve the environment for future generations.

Coarse Fisheries: Still water and slow moving water inland fish (e.g. roach, tench, carp).

Consumer Surplus: The difference between what a person would be willing to pay and what he actually has to pay to buy a certain amount of a good

Contingent Valuation Method: Evaluation technique that directly asks people what they are willing to pay for a benefit or willing to accept in compensation for tolerating a cost through a survey or questionnaire. Personal valuations for increases or decreases in the quantity of some good are obtained contingent upon a hypothetical market.

Cost-Effectiveness Analysis: Least expensive way of achieving a given environmental quality target, or the way of achieving the greatest improvement in some environmental target for a given expenditure of resources.

Demand Curve: A graphic representation of relationship between prices and corresponding quantities demanded per time period. The relationship between quantity demanded of the good and the price, whether for an individual or for the market (all individuals) as a whole.

Diminishing Marginal Utility: The principle that says that as an individual consumes more and more of a good, each successive unit increases her utility, or enjoyment, less and less

Discount Rate: Degree to which future money is discounted relative to current money. Economic analysis generally assumes that a given unit of benefit or cost matters more if it is experienced now that if it occurs in the future. The degree to which the importance that is attached to gains and losses in the future is known as discounted. The present is more important due to impatience, uncertainty, and the productivity of capital

Disposable Income: The amount of an individuals income that remains after the deduction of income taxes.

Economic Rents: Payments made to a factor that are in excess of what is required to elicit the supply of that factor.

Efficiency: The allocation of goods to their uses of highest relative value.

Existence Value: Value from simply knowing environmental goods exist independent of any use.

Externalities: A situation in which an individual or firm takes an action but does not bear all the costs (negative externality) or receive all the benefits(positive externality). They are thus costs or benefits that fall on third parties.

Game Fisheries: Sea, brown and rainbow trout and salmon fishery.

Hedonic Pricing Approach: Derives values by decomposing market prices into components encompassing environmental and other characteristics through studying property values, wages and other phenomena. The premise of the approach is that the value of an asset depend on the stream of benefits derived, including environmental amenities.

Intergenerational Equity: Fairness between generations

Intrinsic Values: Value that resides 'in' something and that is unrelated to human beings altogether.

Marginal: The additional or extra quantity of something. If one drinks six sodas in a day, the marginal soda would be the sixth soda.

Marginal Cost: The increase in total costs as one more unit is produced.

Multiplier: The number of times new investment spending will be re-spent to produce a certain amount of new income.

Opportunity Cost: The highest-valued sacrifice needed to get a good or service.

Option Value: An environmental value relating to the option to use an asset in the future.

Present Value: Value today of a sum to be paid or collected in the future to buy a good or service.

Property Rights: The conditions of ownership of an asset, the rights to own, use and sell. The right to use or consume something, *or* trade the right away in return for something else.

Public Goods: Goods that cannot be withheld from people even if they don't pay for them. A good which, if made available to one person, automatically becomes available to all others in the same amount.

Substitutes: Price change for one product leads to a shift in the same direction in the demand for another product.

Supply Curve: A graphic representation of the relationship between quantities supplied at each price for a given time period.

Travel Cost Method: Derives values by evaluating expenditures of visitors to recreational sites. Travel costs are used s a proxy for price in deriving demand curves for the recreation site.

WTA (Willingness To Accept): Minimum amount of money one would accept to forgo some good or to bear some harm.

WTP (Willingness To Pay): Maximum amount of money one would give up to buy some good.

ACRONYMS

CATI Computer Assisted Telephone Interviews

CBA Cost Benefit Analysis

CS Consumers' Surplus

CV Contingent Valuation

CVM Contingent Valuation Method

EAFR Environmentally Acceptable Low Flow Regime

LR Likelihood Ratio

NRA National Rivers Authority (Now the Environment Agency)

OLS Ordinary Least Squares

TCM Travel Cost Method

WTA Willingness to Accept

WTP Willingness to Pay

EXECUTIVE SUMMARY

Introduction

This report comprises the results of Module B, focusing on indirect economic values associated with fisheries, being part of the Agency's "Economic Evaluation of Inland Fisheries" R&D programme.

Module B

Module B was split into two distinct phases and comprised an assessment of anglers' expenditure and consumers' surplus (the additional value gained over and above the amount they pay for); the general public's "non-use values" for fish populations. The latter includes values held relating to possible future use (option value), value relating simply to knowing that they exist (existence value) and value relating to knowing that fish exist for the benefit of future generations (bequest value). In addition, the social benefits of angling and the importance of angling in local economies were also briefly considered.

Literature review

The literature review considered the theoretical considerations underlying the different economic values relating to angling and inland fish populations. In particular it highlighted the difference between "economic impact assessments", which predominantly relate to injections of money into local economies and the creation of jobs, and "economic welfare analysis" which relate to the net economic benefit to individuals and thus society as a whole, and is commonly measured by individuals "willingness to pay".

Module B - Phase 1

Phase 1 involved carrying out three small-scale contingent valuation surveys focussing on the value of three different UK fisheries. The studies were carried out between October 1998 and January 1999. As well as providing results from relatively small survey activity in three areas, it gave an opportunity to develop and test the most appropriate methodologies to be used in the Phase 2 national surveys carried out in 1999/2000. The Phase 1 surveys and results were as follows:

The River Thames: The Existence Value of a Salmon Fishery

The main aim of the Thames Case Study was to initiate investigation into the economic value accruing to the general public from the re-introduction of a self-sustaining population of salmon (living and breeding) to rivers within the Thames Region. Data was collected using a basic contingent valuation (CV) telephone survey of the general public living in the Thames catchment area. The best estimate WTP value of responses was £2.40 per household per year. Based on the 5 million households in the Thames Region, then, there may be a potential economic value of introducing living and breeding salmon to rivers in the Thames Region of £12 million per year.

The Afon Teifi: The Value of Angling to Rural Communities

The main aim of the Teifi Case Study was to determine the economic impact of expenditure relating to angling on the Afon Teifi (a low income rural area) in terms of local income generated and angler consumers' surplus (i.e. the additional enjoyment that anglers gain per angling trip over and above the amount of money they actually spend). Data was primarily collected using a short contingent valuation mail survey questionnaire targeted at Teifi anglers and angling clubs.

The total expenditure on fishing for Salmon and Trout was estimated at £830,000. This is the sum of the direct, indirect and additional expenditure on fishing by the anglers. The multiplier effect that the total investment has magnifies the actual impact, from fishing, on the local economy to an estimated £1,100,000. Estimated annual expenditure of Teifi anglers directly related to angling was £605/angler. The best estimate WTP value is taken as £7.50 per trip. When multiplied by the number of annual fishing trips made to the Teifi this would give a total consumer surplus of £70,000 per year.

Fisheries in Urban Leeds: The Value of Angling to Urban Communities
The objective of the Leeds case study was to determine the economic and social importance of angling in an urban environment, specifically considering consumer surplus, direct expenditure, reasons why fishing is undertaken and social benefits. Estimates of consumer surplus and direct expenditure were achieved using a short contingent valuation postal survey of anglers in Leeds.

The best estimate WTP for consumer surplus was taken as £1.80 per trip. Total annual consumer surplus was calculated as £260,000 when multiplied by the average number of trips made by Leeds fishermen to Leeds urban areas. Estimated annual expenditure of Leeds anglers directly related to angling was £600/angler.

Module B – Phase 2

National Angler Survey
A telephone contingent valuation survey approach was considered the best means of eliciting information from anglers on the type of angling, existing angling expenditures and angler consumers' surplus. In total, 806 anglers completed a questionnaire. The anglers were drawn from six regions within England and Wales, namely: North East, North West, Anglian, South West/Wales, Southern/Thames and the Midlands.

The results revealed a conservative estimate of average consumer surplus per angling trip of around £2.10 for coarse fishing and £2.70 for game fishing. This value represents the additional value gained per angler for each angling trip, as measured by their willingness to pay more for it.

Expenditure by anglers on angling related goods and services on an annual and per trip basis was found to be substantial. The average annual expenditure for coarse angling is £859, although the median is £314. Given that there are approximately 2.3 million coarse anglers (NRA, 1994), total expenditure relating to coarse angling in England and Wales may be in the order almost £2 billion. The average expenditure per trip for coarse angling is £17, although the median is £10.

The average annual expenditure for game anglers is £682 and the median is £276. Likewise, given that there are approximately 0.8 million game anglers (NRA, 1994), total expenditure relating to game angling in England and Wales may be in the order of £545 million. The average expenditure per trip for game anglers is £27 and the median is again £10.

It must be recognised that the accuracy of this value is uncertain, mainly due to possible strategic behaviour by the anglers answering the questionnaires.

General Public Survey

The economic evaluation of benefits accruing to the general public from maintaining and improving fish populations within inland water bodies in England and Wales was also considered best achieved through a Contingent Valuation (CV) study. The study was based on a face-to-face household questionnaire designed to determine non-user (e.g. existence and bequest values) and user values (e.g. from watching fish) based on individual's willingness to pay for improvements in fish populations. The final sample was composed of 843 respondents, interviewed across the eight Environment Agency regions.

The survey revealed that individuals are willing to pay small amounts (average £3.73/house/year) to maintain or improve the size and number of fish in their nearest waterbody. When multiplied up and aggregated for the population local to a waterbody, these values may be considerable. It is interesting to note that 85% of respondents lived within 20 miles of the water body they selected as the nearest waterbody that they knew well. It is also worth noting that 52% of respondents claim to at least sometimes observe the fish in their nearest waterbody.

The responses for the River Wye scenario suggests an annual benefit of £40 million for enhancing the river to improve salmon numbers to their original levels of ten or so years ago. The actual value is quite uncertain, as is indicated by the high and low estimates. If other waterbodies were included in the questionnaire, the value per site would probably be significantly reduced. However, the value may be of a similar magnitude for other waterbodies of similar stature.

The Economic Model

A paper-based working model was developed to help determine approximate angler consumer surplus values and general public non-use values for different water bodies, fish types and Agency regions. It was developed to be as practical as possible for fishery managers to apply. However, due to the potential for miss-application, an experienced economist should oversee any serious use of results.

Recommendations

In terms of using the valuation results:

- Angler consumer surplus values may be considered as being reasonably robust.
- The general public's value for fish in their nearest water body should be used with care, particularly with respect to which populations are used to aggregate the results.
- Values for the River Wye must be used with the greatest caution of all, particularly if trying to apply them to other waterbodies.

In terms of application of the values, there is scope for using or adapting the information for use in:

- Damage assessments for pollution of waterbodies.
- Justifying enhanced expenditure on fishery management.
- Project appraisals where there are potential impacts to fish stocks.
- Helping to assess the economic value of waterbodies.

However, there is also a need for further related studies in order to:

- Confirm the reliability of the general public values identified in this study.
- Obtain a better understanding of which households to aggregate non-use values for.
- Explore the relationship between the public's preferences for inland fish and other associated conservation values
- Assess the value of inland fisheries with respect to wider social benefits.

1 BACKGROUND

1.1 Introduction

As part of the sustainable and integrated management of air, land and water the Environment Agency has specific responsibilities for water resources, pollution prevention and control, flood defence, fisheries, conservation, recreation and navigation. In particular, under the Salmon and Freshwater Fisheries Act 1975 as carried forward under the Environment Act 1995, the Agency has a statutory duty to "maintain, improve and develop the salmon, trout, freshwater and eel fisheries" of England and Wales, including up to 6 miles from the shore. The Agency also has a duty to have regard to costs and benefits when exercising its powers.

Recently the Government commissioned a review of policy and legislation relating to salmon and freshwater fisheries (MAFF 2000). The principal conclusion from the review was that the conservation of freshwater fish and the management of fisheries should aim to:

- ensure the conservation and maintain the diversity of freshwater fish, salmon, sea trout and eels and to conserve their aquatic environment;
- enhance the contribution salmon and freshwater fisheries make to the economy, particularly in remote rural areas and in areas with low levels of income;
- enhance the social value of fishing as a widely available and healthy form of recreation.

In addition, the Environment Agency has developed a vision for its contribution to sustainable development and within this vision there are two important components which recognise the human and fish dimensions of fisheries, namely improving the quality of life and enhancing wildlife.

So that the Agency can face the challenge of meeting its statutory obligations as an environmental regulator, whilst addressing its wider aims, certain operating principles need to be adopted, such as integrated catchment management, sustainable resource management and an appropriate level of funding. Fundamental to the Agency's potential success is a sound knowledge of the true economic value of inland fisheries and information on the economic consequences of its activities.

At present, there are few sound economic evaluations of inland fisheries for the Agency to refer to when exercising its powers and carrying out its duties. Consequently, the Agency Fisheries Division has a strong interest in developing a greater understanding of the economic value of inland fisheries. The Agency needs such information to address its statutory obligations and to assess and prioritise its activities, in view of progressively diminishing resources and the requirement for the Agency to be seen to allocate its resources between potentially competing interests in a fair manner.

This report comprises the results of Module B of the Agency's "Economic Evaluation of Inland Fisheries" R&D programme. It provides details of an assessment of angler consumers' surplus, the general public's option, bequest and existence values of fishing and fisheries, the social benefits of angling and the importance of angling in local economies.

1.2 Objectives

The overall objective of this multi-modular study of the economics of inland fisheries is to:

provide estimates of the economic value and benefits of inland fisheries in England and Wales and specifically to consider:

(Module A)
- *The economics of fishing rights*

(Module B)
- *The economic values associated with fisheries including:-*
  - *anglers' Consumer Surplus, Option, Bequest and Existence values of fishing and fisheries*
  - *the social benefits of angling and the importance of angling in local economies*

Specific tasks and objectives of Module B were to:

Phase One

Undertake case studies to determine:
- The value of angling to rural communities
- The value of local economy benefits from angling
- The existence value of a fishery

Phase Two

1 Critically review the literature on the economic benefits of inland fish and fisheries.

2 Quantify and compare values for different fishery types across England and Wales for the following:
- Angler consumer surplus
- Existence and bequest values of fish stocks
- Option value of angling
- Value of angling to local communities in rural and urban areas

3 Identify the social benefits of angling and compare these between different socio-economic regions.

4 Identify factors which determine and influence:
- The value of consumer surplus
- Existence, bequest and option values
- Social benefits of angling and adjacent values
- Value of fisheries to local communities

5 Evaluate trends in the total and marginal values of:
- Angler consumer surplus
- Existence, bequest and option values
- Social benefits
- Fishing to local communities

6 Produce a paper-based working model which will enable fisheries managers to establish:
   - Angler consumer surplus
   - Existence, bequest and option values
   - Social benefits
   - The value of fishing to rural and urban economies

Phase One was carried out between October 1998 and January 1999. As well as providing results from relatively small survey activity in three areas, it gave an opportunity to develop and test the most appropriate methodologies to be used in the later, Phase Two national survey surveys carried out in 1999/2000.

Following the lessons learned whilst completing the Phase One Case Studies, it became apparent that given the project resource constraints, it was too optimistic to achieve all the Phase Two objectives. This was made particularly clear when developing the anglers and general public contingent valuation surveys and the agreed need to obtain robust questionnaire responses. Further, there was a natural constraint in terms of how many questions could be asked in the contingent valuation surveys and a strong need for realistic, practical and focused valuation scenarios. Therefore, the ability of the analysis to obtain appropriate information covering all aspects of the study objectives was limited. As a result, and following discussion with the Agency, it was agreed that less effort would be expended in Phase 2 on - *the social benefits of angling and the importance of angling in local economies* whilst resources would be concentrated on estimating - *anglers' Consumer Surplus, Option, Bequest and Existence values of fishing and fisheries.*

1.3 Content of Report

The report includes sections covering the following:

Section 1: **Introduction** to the study.

Section 2: **Methodology** outlining the approach taken for the study.

Section 3: **Literature Review** critically assessing the existing literature on the economics of inland fisheries

Section 4: **Case Studies** reporting on the results of the three initial case studies.

Section 5: **Anglers Survey** detailing the results of the national anglers' survey, undertaken to assess consumer surplus relating to the angling activity and angling expenditure.

Section 6: **General Public Survey** detailing the results of the national general public survey undertaken to assess option, existence and bequest values relating to inland fish population.

Section 7: **The Economic Models** providing an initial means of assessing economic benefits relating to inland fish and fisheries. In addition, the wider social benefits and value of angling to the national economy is discussed.

Section 8: **Conclusions** indicates what the overall results actually mean.

Appendices: The Appendices include copies of the questionnaires used, references, results of the statistical analysis (in STATA) and a disc containing raw survey data.

2 METHODOLOGY

2.1 Literature Review

The Environment Agency specification for Module B literature review was to:

"Critically review the literature on:

- **The application of anglers' consumer surplus**
- **Existence and bequest value of fish stocks**
- **Option value of fishing**
- **The application of total and marginal net economic values of angling and dependent/adjacent recreational activities in/close to rural communities and in urban communities**
- **The contribution of angling expenditure to economic activity**
- **The social benefits/disbenefits associated with angling"**

This was a wide ranging remit covering many different types of economic value. There was therefore a need to impose an analytical structure ensuring that the appreciation of the recreational fisheries literature is appropriately nested within a coherent and accepted framework.

One complication was that the given remit embraced at least two approaches to evaluation ((1) Total Economic Value/Cost Benefit Analysis and (2) Impact Studies) and indeed the implied coverage of both is somewhat partial. Also, the intention was to make this review accessible to a non-specialist audience. It was therefore necessary to produce a synthesis of the two theoretical approaches and the relevant applied work.

The introduction of Section 3 identifies the two approaches implied by the original brief and explains why non-economists should not be surprised about the existence of more than one form of 'economic' evaluation. The two approaches and their application to recreational fisheries are discussed separately (though inevitably some applied work straddles both methods). In each section a theoretical discussion precedes the appreciation of applied work.

2.2 Case Studies

The Phase 1 Case Studies were generally intended to:

- Provide an indication of the economic importance of the angling activity and fish stocks to different sections and regions of society; and to
- Allow for a range of study, survey and analysis techniques to be tested in preparation for the National Surveys, carried out in Phase 2 of the study (1999-2000).

Figure 2.1 shows the location of the case study areas as well as the different Environment Agency regions.

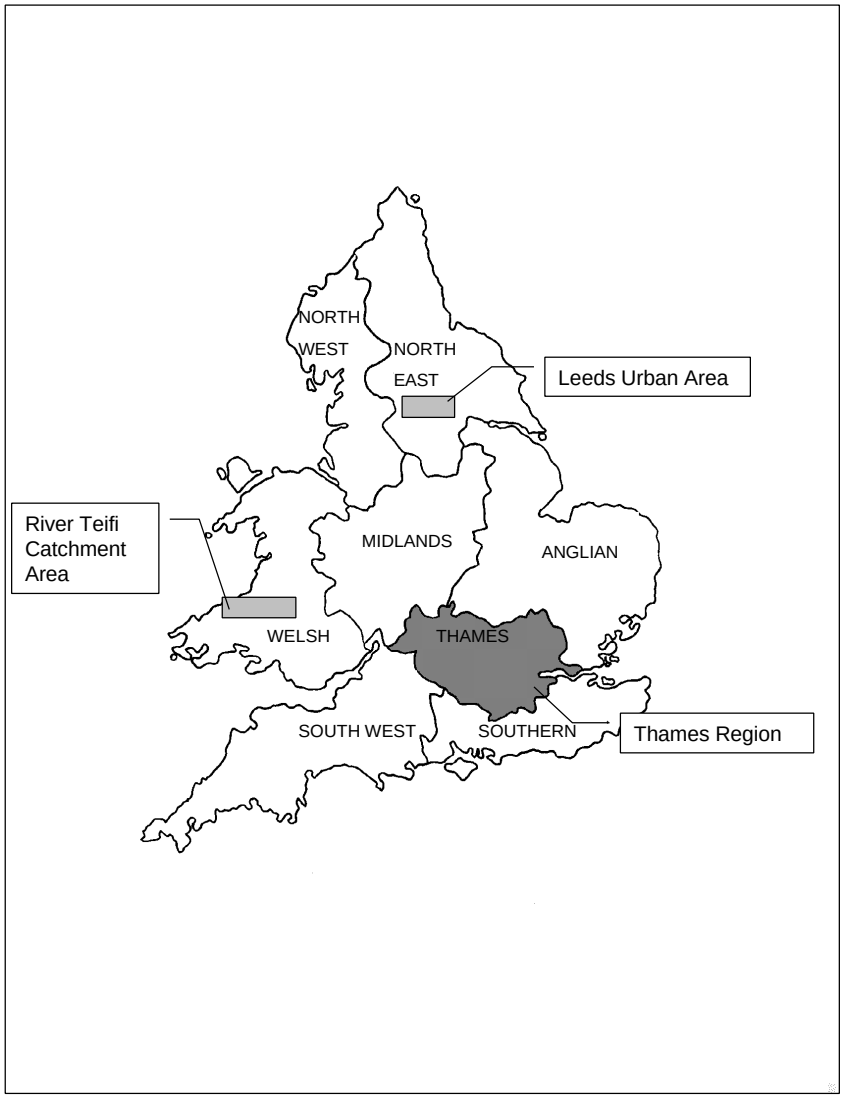


Figure 2-1 Environment Agency Regions and Location of Case Studies

2.2.1 The River Thames: The Existence Value of a Salmon Fishery

The main aim of the Thames Case Study was to initiate investigation into the economic value accruing to the general public from the re-introduction of a self-sustaining population of salmon (living and breeding) to rivers within the Thames Region. A further objective was to assess the relative importance of different factors or motives constituting the overall value. Such motives include elements such as 'option', 'bequest' and 'existence' values.

Data was collected using a basic contingent valuation (CV) telephone survey of the general public living in the Thames catchment area.

2.2.2 The Afon Teifi: The Value of Angling to Rural Communities

The main aim of the Teifi Case Study was to determine the economic impact of expenditure relating to angling on the Afon Teifi (a low income rural area) in terms of local income generated, particularly by visitors to the area. In addition, the study aimed to investigate

anglers' consumer surplus, i.e. the additional enjoyment that anglers gain per angling trip over and above the amount of money they actually spend.

Data was collected using a short contingent valuation mail survey questionnaire targeted at Teifi anglers and angling clubs, together with a site visit to the Afon Teifi area which involved interviewing a selection of relevant individuals and organisations.

2.2.3 Fisheries in Urban Leeds: The Value of Angling to Urban Communities

The objective of the Leeds case study was to determine the economic and social importance of angling in an urban environment, specifically considering consumer surplus, direct expenditure, reasons why fishing is undertaken and social benefits.

Estimates of consumer surplus and direct expenditure were achieved using a short contingent valuation postal survey of anglers in Leeds which asked about their fishing activity and expenditure within the Leeds urban area. Information about the social benefits of angling was gathered from a mixture of interviews, discussions, printed material and the questionnaire. It should also be noted that social benefits are difficult to quantify and therefore the analysis takes a qualitative form, discussing the benefits of angling to youth, the disabled and as a social club activity.

2.3 National Anglers Survey

The conventional contingent valuation approach was considered the best means of eliciting information on the type of angling, existing angling expenditures and angler consumers' surplus.

It was decided that the most appropriate way of undertaking such a questionnaire survey from a representative sample of anglers would be through a telephone survey. The Phase 1 Case Studies for Teifi and Leeds had highlighted the problems of obtaining representative responses from anglers from postal questionnaire surveys (see Section 4). It had also demonstrated the value of undertaking telephone questionnaires using CATI (Computer Assisted Telephone Interviews). Budget constraints and potential sampling biases had precluded the use of face-to-face angling questionnaires. This latter approach could have been an option if it was decided to undertake much smaller samples at various different angling sites.

A telephone contingent valuation questionnaire was developed through an iterative process with the Environment Agency steering committee, project team members and several external practising environmental economists. Draft questionnaires were also conducted on anglers known to the project team. Finally, the questionnaires were piloted using the CATI approach on 15 anglers. The response from the anglers questioned was positive, and only minor amendments were required.

The full questionnaire survey was conducted in October 1999. The selection process of respondents was made on a stratified basis, with interviewees being drawn from Environment Agency's database of angling licence holders. In total 806 anglers completed a questionnaire. The anglers were drawn from six regions within England and Wales, namely: North East, North West, Anglian, South West/Wales Southern/Thames and the Midlands. Unfortunately the South West/Wales and the Southern/Thames regions had to be combined in this way due to a technical problem relating to angler postcodes. The proportion of anglers selected in each

region reflects the actual number of anglers in that region. Furthermore, the anglers' sample selection was based on the type of rod licences sold on a regional basis. Thus in theory, the type of angling each respondent carries out should roughly reflect the proportion of that type of angling conducted. Table 2.1 shows details of the number of respondents in each region. A full questionnaire is reproduced in Appendix A.

Table 2-1 Regional Distribution Of Respondents

Regions	No of Respondents	% of Respondents
North West	155	19.2
Anglian	108	13.4
North East	92	11.4
SW/Wales	113	14
Southern/Thames	157	19.5
Midlands	181	22.5
Total	806	100

The questionnaire was structured as follows. The first part elicited respondents' general attitude towards fishing and the type fishing activity they carried out. Information gleaned included the type of fish they target, the type of water body generally fished, the licence they hold, the frequency and costs of their angling activities, and their motivations for going fishing.

The second part of the questionnaire focused on the respondents' **usual fishing site**. This included assessing the type of water body, the type of fishing, their perception of water quality and of fishery quality, living distance from the site, the number of substitute sites, frequency of visits, annual expenses and their general utility gained.

The third part was the evaluation section. This aimed at eliciting the respondents' **Willingness To Pay "any additional amount" for preserving the fish population at the usual fishing site at the current levels (a proxy for consumer surplus relating to angling activity)**. Respondents' motivations underlying their bids and refusals to bid were also collected.

Finally, the fourth part collected socio-economic characteristics of the interviewees, which included environmental group affiliation, education, work status and income. This information was gathered to help determine how representative the sample was, and to undertake the validity assessment.

For the analysis of results, population samples were split into individuals that undertake coarse fishing and those that undertake game fishing (i.e. salmon and trout). The latter amalgamation was necessary due to the relatively small sample sizes for game anglers. The analysis then investigates differences on a regional basis and is further sub-divided according to the type of water body. Analysis is also undertaken to assess the socio-economic characteristics of the respondents, and to test the reliability and validity of the study results using regression analysis.

2.4 General Public Survey

As with the angler's survey, the economic evaluation of benefits accruing to the general public from maintaining and improving fish populations within inland water bodies in England and Wales was considered best achieved through a Contingent Valuation (CV) study.

The study was based on a face-to-face household questionnaire designed to elicit non-user and user (e.g. from watching fish) willingness to pay for improvements in fish populations.

The original case study focussing on non-user benefits (Thames salmon) was undertaken using CATI (computer assisted telephone interviews). However, **it was deemed that the issue of non-use values of fish populations warranted a longer more detailed questionnaire**. This is due to the need to fully explain the scenarios being considered, since it is an unusual market scenario being created.

The contents of the questionnaire were developed through an iterative process involving several draft versions being sent between team members, the Environment Agency and several external environmental economists. Lengthy discussions were needed to arrive at the two eventual scenarios that were selected. It was agreed not to use hypothetical sites, but rather to use real sites with hypothetical circumstances. However, the scenarios developed were considered to be relatively realistic. Formal focus groups were not used, due to budgetary constraints, but several individuals completed draft questionnaires. Considerable effort was made to ensure that the questionnaires were straightforward and well understood.

A pilot survey was then undertaken on 10 members of the public. This was considered a useful exercise, and a number of small changes were made. In particular it was felt important to separate the two scenarios through use of a completely different question in between the scenarios.

The sample for the final full survey was chosen based on a random selection basis and interviews were carried out in person (face to face). The sample was composed of 843 respondents, interviewed across the eight Environment Agency regions, namely Southern, South West, Wales, Thames, Midlands, Anglian, North West and North East.

The CV questionnaire (Appendix B) was designed to gather information on use and non-use motivations, held by the general public, for valuing fish population within England and Wales.

The first part (section A, questions 1 to 4) concentrated on environmental attitudes of the interviewees. This part focused on the importance of *the natural environment* with respect to other major social issues, it investigated what type of environmental sites were of most interest. It also gleaned information on different waterbody features appreciated by the public, and gave insights as to what activities respondents undertook in or near waterbodies. An important function of this section was to get respondents to realise that there are various things they may wish to spend their money on. It was also useful to assess the relative importance of fish populations compared to other environmental features.

The second part (section B, questions 5 to 31) introduced the respondent to two evaluation scenarios. The first of these scenarios concerned the **nearest water body** that the respondent could recall during the interview. Information was collected on the type of water body, substitute sites, distance from home, average number of visits, activities undertaken, and both water and fish population quality. Respondents were then asked to express their **WTP for improving the fish population quality at this site, by means of unspecified payment mechanisms.**

The second scenario focused on the **River Wye,** located in the Environment Agency Wales Region, and adjacent to the Agency Midlands Region. In this case the main purpose was to

assess respondents' **WTP for supporting a scheme that would improve salmon populations**. Since only one river was considered for all, it meant that true non-use values could be assessed, as well as looking at effects of distance decay.

The third part (section C, questions 32 to 36) gathered information on the respondent's socio-economic characteristics. This included information on social class, age, income and education. Again, this information is essential in the analysis of WTP responses and to ensure that the sample is suitably representative.

Analysis of results involved assessing the validity and reliability of the willingness to pay estimates using regression analysis, standard statistical measures and sample size analysis. Other analysis included assessing the robustness of the payment principle question and determining the representativeness of the sample.

2.5 The Economic Model

The development of a paper-based working model was constrained by the information it was possible to collect from the questionnaire surveys, and from the actual results of the surveys. The latter was true with respect to which factors appeared to affect the values and an understanding of what type of information will be readily available to fishery managers to apply the model. However, an attempt has been made to produce a simple model that is both practical and of use.

Models were developed for consumer surplus relating to angling activity and general public's use and non-use values relating to fish stocks. They are simply based on differentials in average willingness to pay for different sample sub-categories. Adjustments were also made to the willingness to pay values to reflect biases in respondents' characteristics due to the selection process.

2.6 Social Benefits and Local Economy Benefits

As explained earlier, the approach taken to assess wider social benefits and local economy benefits was necessarily restricted. However, relevant information for these aspects was gleaned both from the Case Studies and the two national questionnaire surveys. Sections 5 and 6 document the relevant findings from the national studies. Some further discussion is made in Section 7.

3 LITERATURE REVIEW

3.1 Introduction

Economic evaluation is simply an assessment of the impact of change. The change, which may have its origins in a policy initiative, could have substantial impacts on many individuals and identifiable groups who gain and lose in a variety of complex ways. In any evaluation, economic or otherwise, decisions need to be made about the scope and limitations of the evaluative process. Brown (1984) argues that the 'held values' (value judgements) determine not only the boundaries of any evaluation, but also the logically appropriate uses of its findings.

The held value(s) is a statement of what is 'desirable' or “good” (a desideratum or a welfare function). One may also refer to the constituency element of a held value statement, which is a description of to whom, what or when the basic desideratum applies. An evaluation may seek to assess the impact of a change from the perspective of society as a whole, or a narrower constituency such as a particular geographical region, sector, income group, time period to the exclusion of other constituencies similarly affected by a change. Held values thus simply identify which of the many effects of a change are relevant to a proposed evaluation. Indeed, in the absence of implicit or explicit held values, we cannot systematically or meaningfully evaluate the benefits and costs to individuals or to groups of individuals.

Historically, two kinds of ‘economic’ evaluations have been applied to angling in the UK and elsewhere; each predicated on a different set of held values. One set of evaluations focuses on the *impact* of angling on local/regional economic activity and the remit of this literature review make explicit reference to this form of study *(“the contribution of angling expenditure to economic activity”).* These impact studies reflect a particular set of held values. For example, a Tourist Board's concern may be with the effect of visiting anglers’ spending on regional income and/or employment. It is thus likely to request an impact study employing Keynesian income multipliers and/or input-output analysis. It should be noted that regional impact evaluations are often narrowly focused as delimited by the underlying held values. Since the primary focus is regional income and employment, by and large, individual resident's preferences are ignored because it is not their Willingness To Pay (WTP) which is being measured (nor indeed is anglers’ WTP measured). Not everyone within a region will benefit from an influx of visiting anglers. Local anglers suffer from increased day ticket prices, bank congestion, noise, with no obvious employment or income benefit to themselves from more visiting anglers. Generally there are many things which may be important to residents of a regions (distribution of wealth within a region, social relations, traditions, environmental quality, age composition, congestion, architecture). Whether practitioners seek also systematically to evaluate these depends on the agreed held value of the study. Clearly, impact evaluations are usually highly partial evaluations of change.

Another set of held values define the scope and limitations of the Total Economic Value/Cost Benefit Analysis (CBA) framework. Here the held value focuses on the strength of preference of all individuals affected by a change. This may be encapsulated in a statement such that: *individual preferences should count and preferences can be measured using willingness to pay (WTP)*. A CBA type evaluation would take preferences as it finds them, no matter how potentially bewildering and idiosyncratic and offensive they may seem. Whilst this type of economic evaluations offers important and unique insights, the held values impose limitations. For example, the evaluation process itself would be unconcerned about differential impacts on income groups, regions or sectors of the economy - unless a held value

relating to the preferred distribution of income and wealth between individuals, regions or sectors is specified. Similarly, the evaluation may allude to the effects of a change on traditions, social relationships and cohesion, behaviour and institutions; however, it can only quantify these in so far as they are articulated, understood and reflected in WTP (or some surrogate such as prices of inputs, output, consumer and producer rents). The held values, above, would also require us to accept that it is the consequences of something which determine whether it is right, wrong, valuable or valueless, with the inference that natural capital only has value if individuals assign and attach value to it.

Despite limitations, CBA provided important insights into the impact of change and, in a variety of ways, may also influence the eventual outcome of the decision process. Indeed, Section 39 of the Environment Act of 1995 require that in exercising its power the Environment Agency has a general duty to consider the likely costs and benefits, though not necessarily to undertake a CBA. The remit of the literature review refers to dimensions of the CBA framework (option value, bequest value, and consumers' surplus).

Section 3.2 below deals with the theoretical framework of the Economic Value/CBA paradigm and is followed by an appreciation of applied work. Section 3.3 follows a similar structure in its assessment of impact studies.

3.2 Economic Value/CBA

3.2.1 Theoretical Considerations

Individuals' preferences for a particular good or service are reflected in their WTP for that good or service. This approach to assigning value has the considerable advantage that it can be applied to a very diverse range of goods and services. Economic values thus provide a monetary measure of society's preferences for the alternative uses of its scarce resources, where society's preferences are taken as the aggregate of the individual preferences of its members.

When we use the term 'economic value' or 'costs' and 'benefits' within CBA then implicitly we are referring to a measurement of WTP. The ***gross*** economic value of allocating resources to produce a given quantity of a good or service is given by the sum of individuals' WTP for that quantity. The ***net*** economic value of a good or service is derived by subtracting from its gross economic value ***the opportunity costs*** of production. These costs measure what society forgoes by allocating resources to produce the given quantity of the particular good or service rather than something else. It is conventional to use the actual market cost of the inputs used to produce the good or service as a surrogate for the opportunity costs of the resources used in production. However, there are circumstances in which the market prices of inputs do not accurately reflect opportunity costs. In such cases ***shadow prices*** should be used to represent true opportunity costs.

The net economic value of the ***total*** production of a good or service can only inform us about the change in value that would result from the complete demise of that resource allocation (e.g. complete destruction of a fishery). However, resource managers and policy makers are generally more interested in the smaller changes in value that would follow ***marginal changes*** in the quantity or quality of production. In order to identify marginal values, some estimate of the sensitivity of the total value to specific changes in production needs to be made.

It should be recognised that the objectives of the study make reference to both the fish stocks and fishing. These are not synonymous and quite subtle differences exist and they need to be discussed separately

The Economic Value of Angling Activity

The product of a recreational fishery is the experience of fishing enjoyed by anglers. Catches of fish are not the direct product, although the magnitude of anticipated and realised catches will have an effect on the quality of and WTP for the fishing experience.

In many other countries, most recreational fisheries are non-priced: access to the fishing site is free. The gross economic value of a non-priced recreational fishery is equal to the aggregate WTP of anglers for their sport, while the net economic value is given by subtracting the market price of the resources that anglers consume in order to go fishing. This is their expenditure on tackle, petrol, bait, accommodation etc. The difference between what consumers are prepared to pay for something (their aggregate WTP), and what they are actually required to pay for it in the market place (their expenditure) is known as ***consumers' surplus***[1]. In other words, the costs to the angler are broadly representative of the costs to society as a whole in terms of the value of output foregone as the angler uses resources to produce his/her recreational experience. So, for a non-priced fishery a first approximation would be that:

Net economic (user) value of angling = anglers' consumers' surplus

The calculation of the net economic value of open-access recreational fisheries or other non-priced activities can therefore focus legitimately on consumers' surplus. Techniques for doing this are considered below. Although consumers' surplus is of importance to the anglers themselves, this is not necessarily the only or primary reason for practitioners seeking to calculate it. Consumers' surplus is estimated because, in this circumstance, it is the net economic value of the fishery to society. The issue of whether it is desirable that a particular group in society (i.e. anglers) are appropriating this net economic value is a separate distributional judgement.

In England and Wales, recreational fisheries are generally privately-owned. Most owners of fishing rights charge anglers for access to the fishing site: the fishery is priced and operates within a market. In a priced recreational fishery, anglers therefore have an additional item of expenditure in the form of the payment made to fishing right owners. In effect, the owners obtain from anglers part of the anglers' potential consumers' surplus. It can be argued that the payments that anglers make to fishery owners for access to fishing sites have, in themselves, no resource allocation implications and therefore do not reflect opportunity costs. Such payments are known as economic rent. So for a priced recreational fishery, the net economic value comprises the remaining anglers'' consumers' surplus plus the economic rent accruing to fishery owners[2].

Net economic (user) value of angling = consumers' surplus + economic rent

[1] This is Marshallian consumers' surplus; there are a number of ways of conceptualising consumers' surplus see Currie et al (1971).

[2] Some would argue (e.g. Copes and Knetsch, 1981) that private ownership may generate higher levels of net economic value as the single owner will manage both congestion and fish stock externalities. The issue here, however, is a procedural one, namely how to measure net economic value with a given set of property rights.

Owners of fisheries own the right to receive a net income flow by letting their fishing. Whether they choose to let their fishing or not, this potential income flow is available, and the rights to it can be bought and sold in the market. The market value of fishing rights represents a capitalisation of the potential income from those rights, in addition to the status value or 'psychic' income derived from the ownership of a fishery. If the potential net income flow represents economic rent, then estimating the total market value of rod fishing rights will give an estimate of the capitalised economic rent in the recreational fishery. It is helpful to assume that any expenses met from the owners gross income flow, such as labour costs, fully reflect opportunity costs. To the extent that labour employed (e.g. ghillies) would otherwise be unemployed, net economic value may be underestimated. It is also assumed that society's opportunity costs of using water and fish stocks for angling are zero (this assumption may need to be reconsidered when we consider the economic value of the stocks themselves). Ideally adjustments would be made for the value of other recreational activities precluded by angling and for the angling-related costs of the Environment Agency in excess of funds received from, say, licence sales. In applied work the practitioners should thus be alert to the possibility of other activity precluded by angling.

Given the considerable angler expenditure on equipment, accommodation food etc., there is the possibility of economic rent/producers surplus associated with the supply of these angling dependent goods and services. The market for angling equipment is reasonably competitive (with mail order etc.) with little inelasticity in the supply of fixed or variable factor. It is reasonable to assume that competition ensures that there are low profit levels in the supply of angling goods and services and therefore only incidental amounts of producers' surplus/economic rent will be generated in this sector.

The literature review for Module A specifically addresses economic rent and the market value of fisheries whilst this review identifies anglers' user values (consumer surplus) as an important component of economic value.

Other Dimensions of the Economic Value of Angling Activity

Economic rent and consumers' surplus associated with the output of recreational and might be termed 'direct consumptive user values' however, it is conceivable that there are other sources of value from the activity of fishing.[3] It is necessary to consider all possibilities. This enables the interests of the Environment Agency, as identified in the remit, to be set in context. It also facilities a discussion of the potential significance of these 'other' dimensions.

(i) Existence Value of Angling. People who neither participate in angling nor intend to participate may derive an 'existence value' from knowing that the angling activity exists and is enjoyed by others.

(ii) Bequest Value of Angling. Individuals may derive some satisfaction from knowing that future generations will be able to participate in the activity.

The common feature of (i) and (ii) above is that they derive from the individual's appreciation of a consumptive use of a natural resource by others. These are passive or non-use values but relate to a consumptive use value! Essentially they arise from the altruism of individuals. They may have a measurable WTP for these altruistic aspirations, which is related to the

[3] The term 'Consumptive' implies a reduction in resource stocks. Fish stocks are renewable and provided harvest rates are less than the growth rate of the stock the biomass can remain undiminished. Also many fisheries practice catch and release. Angling, of itself, does imply reductions in fish stocks.

satisfaction they receive from them. If a sizeable proportion of the non-angling public has some vicarious concern for anglers, then (i) and (ii) might be significant. The converse is probably true with some sections of society regarding angling as a cruel sport. Conceivably, anglers would display vicarious concerns for other anglers or future generations of anglers. Anglers' declared WTP/consumers' surplus (if measured using contingent valuation) probably captures this vicarious concern for their own sport and those who practice it. Existence and bequest values where mentioned in the remit relate to existence and bequest value of *fish stocks* and not angling activity (see below).

(iii) Option Values of Fishing. The remit for the literature review refers to the option value of fishing. Values **(i)** and **(ii)** above reflect circumstances where the individuals are sure of their income, preferences both now and in the future, and the availability of the natural resource when they (and others) wish to use it. If there is uncertainty, say, about the future availability of an activity and if we assume that individuals show 'risk-aversion', then there is the possibility of another category of value.[4] We presume that individuals would be prepared to pay a premium to avoid risk, then this gives rise to their option value.

Anglers may have option values with regard to their own activity in the face of an uncertain future supply of the resource. In this respect, their attitude to risk is of some importance. In any event, if anglers' WTP is estimated through contingent valuation (see below) this will probably capture angler option values. There is also the possibility that non-anglers have an option value to preserve the activity for their own participation at some future date. This is not likely to be significant

(iv) The Social Benefits/Disbenefits of Angling. The interpretation, agreed is that the term 'social benefits' in the original proposal refers to externalities. For externalities to be significant one would need to argue that angling has some kind of transformative value and changes individual participants in a way that confers some benefits on those who directly or indirectly interact with anglers. Perhaps angling reduces stress, or the incidence of anti-social behaviour? If anglers perceive, say, stress reduction and this influences their WTP then consumers surplus captures this private impact. Also, if stress reduction has effects beyond feelings of personal well-being (e.g. increased productivity, more harmonious personal relationships) and anglers perceive this - and are WTP for it - then consumers' surplus captures these knock-on effects. If all these conditions are satisfied there are no externalities and anglers consume the amount of angling which maximises net social benefits. On the other hand, if anglers do not perceive these external effects, or if they do, they are not willing to pay for them, then there may be external impacts that are in addition to consumer surplus. This is possibly only amenable to qualitative work.

The Economic Value of Fish Stocks

Wildlife and amenity assets e.g. (fish stocks) give rise to a range of non-consumptive or passive economic values (as distinct from consumptive uses such as angling) .

(i) Direct non-consumptive user value. Activities such as wildlife photography are non-consumptive, but are still based on direct contact with natural resources. Participants in these activities have a WTP for access. With respect to fish stocks, only at particular locations at

[4] Risk-averse individuals would, for example, prefer a certain outcome of £100 to a gamble having the same aggregate outcome (e.g. a 50% chance of £50 and a 50% chance of £150).

certain points in time will members of the public be able to observe fish. No previous studies have really examined the potential extent of this value.
(ii) Indirect non-consumptive user value. Through reading about wildlife or watching TV nature programmes, an individual may derive enjoyment from a resource without direct contact. Again, WTP is the appropriate measure, but will not be significant for fish stocks in any given surface water area in the UK.

There may also be a relatively significant value associated with the biological support function that fish play in the general environment. Fish populations are likely to support many other animals such as birds and mammals, which can be highly valued by humans. Fish also play a role in controlling smaller organisms and plants. In essence they thus have a valuable role in freshwater and other ecosystems.

(iii) Option Value of fish stocks. Individuals may have a willingness to pay to preserve the option of non-consumptive appreciation of the stock. If **(i)** and **(ii)** are insignificant then so is **(iii).**

(iv) Existence Value of fish stocks. People may derives an 'existence value' from knowing that the natural resource exists. This represents a vicarious concern for the stock and is a passive **non-use** value of the stock.

(v) Bequest Value of fish stocks. Individuals may derive some satisfaction from knowing that future generations will be able to participate in passive **non-use** of a natural resource.

The remit for the literature review only makes reference to the existence and bequest values of fish stocks i.e. **(iv)** and **(v)** above.

The 'values' discussed in Section 3.1 above are additive since they are based on a common assigned value (i.e. WTP) and constituency (i.e. society as a whole). Whilst they are additive, care needs to be exercised as there may be conflict between consumptive and non-consumptive uses of fish stocks. For example, in estimating the net total (or marginal) value of angling one should really make allowances for the impact angling has on those other sections of society who display strong vicarious concerns for fish stocks.

3.2.2 Estimation of WTP and Applied Work [5]

When markets exist, marginal willingness to pay can be obtained from market data. The fundamental problem is that when no or imperfect markets exist then WTP cannot be easily observed. There are a number of techniques available, however. One set of techniques seeks to monetise individuals' strength of preference by observing behaviour in markets close to the amenity assets. These techniques include the travel cost method and random utility or discrete choice models and hedonic pricing. Collectively these techniques may be labelled revealed preference techniques. Another set of techniques utilises individuals stated preference to determine WTP. These methods such as contingent valuation and stated preference depend on some form of direct contact through which individual state their preference.

The primary focus of this review is essentially a critical review of previous economic *evaluations of fishing and fish stocks in England and Wales*. Attention will also be paid to

[5] All values have been converted to current prices 1999-2000 using the HM Treasury deflator series. Values in other currencies have been translated to Sterling using the Inland Revenue average annual foreign exchange rates.

recreational fishery evaluations conducted elsewhere. The intention is not to produce a review of the state of the art of every estimation technique; this would be a quite different and substantial undertaking. The literature below is, nonetheless, categorised by the estimation technique rather than the type of values or changes being quantified. Whilst this may suggest that a critical analysis of techniques themselves is indeed a primary aim, the choice of technique depends on the nature of the evaluation scenario rather than simply the inclinations of practitioners. For example revealed preference techniques cannot be used to quantify non-use values. Presenting studies by technique facilitates both an appreciation of key procedural problems as well as the results themselves.

The Travel Cost Method and Single Sites

Clawson (1959) developed this method which derives a WTP function from an initial relationship between zonal visits per head of population and trip travel costs. Once this initial trip generating function (TGF) is estimated, it is then assumed that site users would react to admissions charges in the same way as they are observed to react to changes in travel costs. Employing this assumption, if a hypothetical site charge was imposed, the per capita visit rate for each of the zones can be predicted. If zonal populations are known the visit rate can be converted into the number of visits that would be made in response to the hypothetical charge. Summing visits over all zones yields the total number of visits to the site for that hypothetical charge. Repetition of this exercise for a range of admission charges allows the derivation of a WTP function, with the area under the curve being the total anglers' consumers' surplus.

Despite the apparent simplicity of the technique there are a number of problems associated with its use. (see Bateman *et al* (1993) for a review). For example, results are sensitive to the precise specification of the dependent variable and functional form of the TGF, the values used for travel time, and (according to some workers) the time spent at the site. Multi-purpose trips may also present a problem in that the necessary division of travel costs between sites becomes arbitrary. The influence of alternative sites on relative visitation rates also needs to be incorporated in the TGF. Attempts to deal with all these problems require larger amounts of data from individuals. The simple form travel cost method is best employed in circumstances where: the site is well defined; alternative sites are known; there are many users; the total number of users is known; detailed information on the personal characteristics of users can be obtained; and users originate from a broad geographical area and visit a single site on their journey. Good quality angling sites satisfy most of the above conditions.

Many studies in the USA have evaluated recreational fisheries using single TCM or a variation of it. These include early studies by Spargo (1971) and Gordon *et al* (1973). The first UK fishery application of the TCM to a single site was by Smith and Kavanagh (1969) who estimated consumers' surplus for the trout fishery at Grafham Water. Total WTP for the season was £432,000 with a consumers' surplus of £205,000. Smith (1971) later refined the updated estimates for Grafham water and re-estimated the season's consumers' surplus at £76,000 and total WTP at £297,000. Lewis and Whitby (1972) also considered the recreational fishery benefits from a reservoir. They estimated a TGF for the three principal categories of users of the Derwent reservoir; anglers, sailors and casual day-visitors. Whilst only two variables were included in the TGF, the found statistically significant results and very similar estimates for consumers' surplus using different functional forms and assumptions about travel costs. In their study annual anglers'consumers' surplus was £60,000 which capitalised over 40 years with an 8% discount rate generates a capital value of £711,000. Shucksmith (1979) applied the TCM to estimate the demand for angling at the

Derwent reservoir. His concern was with the impact of real petrol price on demand functions rather than estimation of economic benefits.

Flegg (1976) used data on three forms of recreation on casual visitors, sailors and anglers on Llandegfedd reservoir in Wales to estimate three demand functions and associated consumers' surplus estimates. The 84 anglers in the survey who purchased season tickets made 4241 visits in 1971 and generated annual consumers' surplus of £18,000. In addition, 2438 daily angling visits produced a consumers' surplus of £37,000. Randerson *et a*l (1978) used the travel cost method to estimate annual consumers' surplus for a stretch of the River Wye at Hereford and obtained a value of £442,000. This is small compared to anglers' gross expenditure at the site, which was estimated to be £5,708,000. Radford (1982) used TCM and estimated annual consumers' surplus of £286,000 for 716 anglers fishing the River Wye salmon fishery. The average values were £397 per angler per year or £21.97 per trip. For the entire population of Wye anglers, annual consumers' surplus was £1,528,000

Radford (1984) used TCM in an effort to estimate consumers' surplus for the Wye and the rivers Mawddach, Tamar and Lune. The earlier estimates for the River Wye were refined in the 1984 study. The previous estimation procedure had ignored travel time in the specification of the TGF function for the River Wye. This produces an under estimation of consumers' surplus. Consumers surplus was now estimated at £71.45 per trip (compared with £21.95) and £1,300 per angler per season (up from £397). The consumer surplus estimates per angler per season for the Mawddach Tamar and Lune were £1,214, £12,224 and £4,457, respectively. The Tamar results are very surprising with consumers' surplus per trip and per angler of quite different orders of magnitude from the other rivers.

O'Neill and Davis (1991) used TCM in a study of recreational angling in Northern Ireland. They undertook 600 interviews at a sample of 15 of the 120 angling sites in the Province. They estimated three demand functions using three different dependent variables (individual visits, zonal visits per capita, zonal visitors per capita) and found that estimated annual user benefits for the Province were £12.96m, £31.62m and £15.18m respectively. This is a clear example of the sensitivity of results to the specification of the TGF. The superiority of individual visits as the dependent variable, as first demonstrated by Brown and Nawas (1973), was confirmed by comparison with their parallel contingent valuation study that estimated user benefits of £10.96m for the Province. In addition, they fitted each of the three specifications to three types of sites, thus generated three coefficients for each site type of demand functions. The equation with individual visits generated both more stable and statistically significant coefficients than the other two specifications.

In the UK, TCM has been applied to **non-angling** amenity water space applications. Anderson (1975) estimated the consumers surplus of potential visitors to Hellifield reservoir and demonstrated that the development of Hellifield was a better option than the proposed Morecombe Bay Barrage. Willis and Garrod (1991) used TCM to value informal, non-priced (i.e. not angling) recreation along selected inland waterways and canals. They used the individual visit specification preferred by O'Neill and Davis and pooled data from 1,502 respondents.

There are two very serious limitations associated with TCM. Firstly, TCM cannot, for example, be used to measure existence and bequest values. This is a restriction that simply has to be accepted. The other problem is that the single site TCM relates only to current resource use levels and the only management action that can be evaluated is the complete demise of the fishery. Single site TCM yields no information about marginal changes in site characteristics;

the above studies only generate average values and care needs to be exercised in their use. The fundamental problem is that a single site will exhibit a certain level of quality that will be the same for everyone who uses it. Researchers have found it necessary to use multiple sites to introduce the necessary variation in site characteristics such as fishing quality. All of this work has been undertaken in the US.

Multi-site Travel Cost Method

One way to develop marginal values is to estimate several single-site demand functions separately and then in a second stage investigate how perameter estimates vary with differences in site attributes. This two-stage approach is very demanding in terms of the data required. Samples and Bishop (1985) estimated a series of site specific demand equations for 11 angling sites. The consumers' surplus estimates from each site are treated as observations on the dependent variable in second regression equation relating consumers' surplus to site characteristics. They used this approach to estimate the effect of changes in angler success on consumers' surplus.

The two stage multi-site approach represents visits to a site as a function only of the travel costs to that site and can only generate values for sites that have large levels of visitation. In reality, the angler may make their travel choice from a number of sites offering different fishing quality and travel costs. An alternative but largely equivalent approach is to estimate one regional or system TCM demand function (see Vaughan and Russell, 1982). If data were available one could estimate all site demand equations together using a system estimation technique. This pooling of data increases the information used in predicting values for a single site in the system.

Sorg and Loomis (1986) estimated a regional/pooled TCM for Idaho and generated consumers' surplus estimates for cold-water, warm water and steelhead fishing of £40.73, £40.61 and £26.45 per trip respectively. Loomis *et al* (1986) used the coldwater data for 51 Idaho coldwater fishing areas and considered the impact of hydro development on the Snake river system Idaho which would affect an eight mile trout fishing stretch. The existing net willingness to pay (consumers' surplus) on the stretch was £2.71m annually. A 50% reduction in fish catch would generate a loss in consumers' surplus of £873,032 whereas a 50% reduction in fish size would generate an annual loss of £1.01m. No estimate was made of option, existence and bequest values and the authors suggest that the total economic value could be between two and five times the estimated annual consumer benefit of £2.71m. Loomis (1989) using pooled data from anglers visiting 21 rivers in Oregon sought to estimate marginal values per salmon. As expected the marginal values per fish varied substantially from river to river and varying with price and the size of the local population of potential anglers. The model also confirmed diminishing marginal value per fish. For example, on the Hood River 10% increase in catch results in value per fish falling from £113.00 to £110.00.

A further development has been introduction of discrete choice or random utility models (RUM). These models, initially developed in transport analysis, seek to model and explain individual choice between sites initially in terms of site characteristics (including travel and other costs). An individual's selection of a closer site with a poorer catch record reveals information about the trade off between catch and travel costs. By including many site and individual characteristics it is argued that RUMs have a superior ability to model anglers' decision making than the pooled continuous TCM models. Morey *et al* (1991) is an example of this approach. The most common mathematical representation of RUM is the multinomial logit (MNL).

The nested multinomial logit model (NMNL) is used if choices are conditional. In other words anglers may face a nested choice structure where they first decide whether or not to go fishing then where to go etc. A two level NMNL was used by Berman *et al* (1997), to examine a proposal to reallocate sockeye salmon from commercial to the sport fishery in Alaska's Kenai river. Bockstael *et a1* (1989) used NMNL to estimate a discrete choice behavioural model for Florida's east cost anglers. Still in Florida Greene *et al* (1997) used NMNL to estimate access values for Tampa Bay.

Provencher and Bishop (1997) have further developed these models by seeking to incorporate the dynamic nature of angler decision making. They argue that anglers decision making is not only conditional it also has a dynamic dimension, since the outcome/success of earlier fishing trips will have an impact on the decision of when and where to fish. Using their dynamic multinomial logit model, they analyse the decisions of fishing club members on the Wisconsin shore of Lake Michigan. Their application includes the impact on angler decisions of expected catch, weather, the time-cost of fishing and time elapsed since the last trip.

As developed, these models potentially offer great flexibility to predict angler participation and willingness to pay under a variety of management options. Difficulties remain in data adequacy and model accuracy. As far as the UK is concerned the travel cost method has not been applied with the level of sophistication evident in US work. One possible explanation is that, in the US, recreational fisheries are unpriced and there is thus a greater imperative to develop and apply techniques for evaluation non-priced assets. In the UK, apart from sea angling, the market provides regular information on the value of fisheries. Of course, none of these studies was able to provide insights into non-use values for fish stocks.

The Contingent Valuation Method

At present, CVM is the most widely used method to evaluate non-priced environmental change. Significantly, CVM is the only technique capable of estimating both use and non-use values. With varying degrees of success CVM has been applied to the following diverse activities: goose hunting in Wisconsin (Bishop *et al* 1983); the scenic beauty of a river, deer hunting and sport diving (Boyle *et al* 1985); elk hunting (Brookshire *et al* 1980); air quality (Brookshire *et al* 1982); government sponsored museums (Gregory 1986); water quality (Harris 1984); river flows (Loomis 1987); recreation in forests (Walsh *et al* 1989) and (Bateman *et al* 1996); non-users WTP for a National Park (Bateman and Langford 1997); and agri-environmental policy (Farizo 1999).

In essence, CVM attempts to create a 'market' for a non-priced activity by asking individuals directly to state their preferences. Individuals are asked to assess their WTP (and/or WTA) for given quantities and qualities of the activity, or alternatively, to consider the quantities and qualities they would demand at given prices. The aim is to elicit valuations in a hypothetical market that would hopefully approximate to the money 'bids' that would be revealed in a real market if one existed. CVM was given a relatively clean bill of health by a Nobel Panel convened by the US National Oceanic and Atmospheric Administration (NOAA 1993). Indeed, most practitioners whenever possible seek to adhere to most of the procedural recommendations of the Panel.

A large part of the literature on CVM is concerned with the accuracy of the estimates produced and many studies have been conducted to test the sensitivity of values to particular research procedures rather than to produce estimates relating to specific policy options. Many

biases have been identified and discussed; see, for example, Edwards and Anderson (1987); Mitchell and Carson (1989); Green and Tunstall (1991). Depending on the nature of the study, many workers believe that many bias problems can be mitigated through sound questionnaire design.

A particular cause for concern is the embedding or part-whole bias and related issues. This arises out of an inability of some respondents to separate the specific change from much larger environmental considerations. It is speculated that individuals may have a notional budget for environmental goods and issues (Bateman, *et al*. 1993b). When confronted by a CVM scenario some individuals may allocate a disproportionately large part of this budget to the one issue. Kahneman and Knetsch (1992) observing that WTP bids were not sensitive to the level of provision suggested that respondents may be purchasing 'moral satisfaction' with their available budget and this purchase was unrelated to the level of provision. Good questionnaire design can prevent respondents from visualising something more inclusive than the change upon which valuation is predicated. This can be addressed by top-down desegregation. For example, respondents are first asked to identify the budget they would devote to all environmental protection, this is then desegregated into air and water quality and so on. In the UK, Goodman *et at* (1998); Green and Tunstall (1991); Garrod and Willis (1996) have used this approach. Willis *et al.* (1996) stressed the current cost of wildlife enhancement schemes to households and the WTP question was couched in terms of multiples of the existing payment. They felt that this emphasises the budget constraint and sets the change in context, thus restraining cavalier bidding.

In addition to using procedures consistent with the production of valid and reliable results, most studies embody specific validity checks on results to ensure they are real and not simply random. Validity in this context is a multi-dimension concept (Whitmarsh *et al*., 1999). For example, the theoretical validity of WTP estimates can be assessed by checking that variables that should theoretically be related to WTP are significant and the coefficients display a sign consistent with the underlying theory of economic behaviour. Convergent validity can be assessed by comparing results generated by CVM and other techniques such as TCM; criterion validity may be assessed by comparing hypothetical payments with such real payments as are available (see Foster *et al*., 1997 for insights into comparisons of real and hypothetical WTP)

Possibly, the greatest difficulties of using CVM probably arise when applied to non-use values, in situations where respondents may initially be unfamiliar with making choices and the true WTP is likely to be a very small part of their budget (see Hutchinson *et al*., 1995 for a discussion). In some contrast, CVM is less problematic when used only to estimate user values among a defined population of repeated users who have clear preferences about levels of provision and who regularly sacrifice their fixed income and time in pursuit of their personal pleasure. Given such a population, face to face presentation of a real, impending and easily understood change using a carefully piloted questionnaire should generate very useful WTP estimates. In other words, angling should lend itself to the generation of reliable estimates of angler user values, particularly in the case of freshwater angling where users pay access charges and practitioners have an obvious payment vehicle (changes in access prices) to build into contingent valuation scenarios.

Despite its own difficulties, CVM has a number of clear advantages over other techniques. It can yield estimates of total or marginal values (the latter are actually more easily estimated) and, provided that respondents are amenable to the type of questioning used, the technique can be applied to almost any requirement. It has been used to evaluate option, bequest and

existence values (see Bishop *et al* 1987, Greenley *et al* 1981 and Walsh *et al* 1984) It is also reassuring that some researchers who have applied both CVM and other techniques, such as TCM, have obtained values of similar magnitude (e.g. Bishop and Haberlein 1979, Walsh *et al* 1989, Hanley 1989, Farber 1988 and Smith *et al* 1986). On the other hand, others, such as Bishop *et al* (1983), have found differences by a factor of 3 to 6 between estimates by different methods.

With respect to the economic evaluation of **angling in the UK**, Dunn *et al* (1989), in a study commissioned by the Ministry of Agriculture Fisheries and Food, used a simple CVM procedure to estimate annual consumers' surplus for sea bass anglers in England and Wales. Using a hypothetical scenario of closure of the fishery, mean WTP (in addition to current expenditure) was £30.60 per angler. Given an estimated population of 490,300 anglers, total annual consumers surplus was £14.9m. There was no attempt to examine the impact of more marginal changes in fishery characteristics. Interestingly, this study also estimated the compensation anglers would require to forego their fishing for one year. With the WTP scenario only 6.5% of anglers refused to answer on a point of principle. In contrast 28% refused to participate in the willingness to accept compensation. Mean angler willingness to accept (WTA) was £389.5m per annum implying a total annual net economic value of £192m. On occasion, other CVM studies in the USA have encountered differences of similar magnitude. In the sea bass study, respondents appeared to have greater difficulty with the payment vehicle and scenario associated with the WTA question. On conceptual grounds WTP is the preferred estimate (NOAA 1993). Dunn *et al.* (1995), updated their earlier study and repeated the WTP/WTA exercise. Mean angler WTP was £74.60 and the population of bass anglers was re-estimated 361,000, producing an estimate of annual consumers surplus for England and Wales of £26.84m. The mean angler WTA was £539.50 with a total WTA for the fishery of £85.1m. The primary purpose of both these studies was the estimation of use values and both the application of CVM and the interpretation of results reflect this. This study was concerned only with angling and non-use values were therefore not addressed.

Willis and Garrod (1991) used CVM to confirm their TCM generated estimates of the consumers' surplus associated with non-priced recreation along selected inland waterways and canals. The CVM part of the study produced estimates of WTP for angling trips at four canal sites of between £0.45 and £0.99 per trip. Unfortunately, the TCM element of the study did not produce angling specific results. The correlation between the TCM and CVM estimates was weak and the latter method was judged to have produced the more reasonable estimates.

Middlesex University (1994) in study for the National Rivers Authority assessed the use values from low flow alleviation on the Rivers Misbourne, Wey and Ver. Surveys and personal interviews were carried out on over a total of 1,000 visitors and 370 anglers. Two flow conditions were evaluated and angling benefits were derived for the rivers Misbourne and Ver. The angler CVM described in a written text the plans to restore the river to a more natural state and to restock with trout. Anglers were then asked about whether they would fish the river and how much they would be prepared to pay for a day's fishing over and above the travelling costs they would incur. A day's fishing on the Ver generated angler user values of between £4.11 and £7.03. The comparable estimates for the Misbourne were £7.03 and £14.06. Annualised values per angler were £67.21 and £87.61 for the Ver and Misbourne respectively. The annual consumer's surplus for the Ver was £396,000 and £697,000 for the Misbourne.

In a study for South West Region, Environment Resource Management (ERM) in conjunction with Newcastle University also addressed the low flow issue (Environment Agency 1998). They targeted five populations (general public in the south west, anglers on low flow rivers, informal recreational users of rivers, general public, properties adjacent to low flow rivers) and used an interesting mixture of techniques (CVM open ended, CVM iterative bidding, CVM discrete choice with stated preference game and a property value study). The CVM with an open ended WTP question was used in the survey of anglers. The scenario was a change to more natural flow than that currently experienced. Anglers were given a fact sheet summarising the effects that would have in terms of ecology, water supply and recreation. There was no description of the improvement in angling and it was assumed that anglers' experience would enable them to appreciate how angling would change with the improved flow conditions. Anglers indicated that on average they would fish 12 more days a year with improved flows between June and August. Club anglers were on average prepared to pay £27.50 per year more in club fees for the improvement in their fishing. Syndicate members were willing to pay £75.20 more rod fees per year. Syndicate members indicated that they would on average increase their fishing days by 28 days. This is a very substantial increase as their current mean was 16 days! The Misbourne and Ver study, above, also suspected that anglers were probably very optimistic about the amount of fishing they would be able to undertake. All of these results relate to game anglers and the samples were small; 48 club anglers and 24 syndicate members.

The Foundation for Water Research (FWR) (1996) produced standard values for environmental effects in its manual for assessing the benefits of surface water quality improvements. The FWR manual was a response to Section 39 of the Environment Act and recognised that there were very few evaluations of marginal changes in angling quality. FWR commissioned a CVM study of coarse, trout, and salmon and sea trout anglers[6].

Table 3-1 Standard Values for Assessing Surface Water Quality Improvements

Angler type	Change	Value (£/person/trip)	Additional trips per person
Coarse	New poor coarse fishery	£4.33	4.21
	New moderate coarse fishery	£4.57	13.5
	New good coarse fishery	£6.97	21.28
	New good trout fishery	£13.32	3.83
	New good salmon fishery	£17.78	2.89
Trout	New good coarse fishery	£8.04	8.76
	New poor trout fishery	£10.02	3.02
	New moderate trout fishery	£11.67	13.06
	New good trout fishery	£18.28	10.98
	New good salmon fishery	£25.43	5.33
Salmon	New good coarse fishery	£13.00	1.16
	New good trout fishery	£21.00	18.4
	New good salmon fishery	£28.82	12.51

Source: (FWR 1996)

The commissioned work also produced estimates of non-use values associated with changes in river quality. A non-use value of £0.00225 per household per kilometre of river was associated with a change in a river from medium to good water quality class. The change from poor to medium generated a non-use value of £0.00607 per household per kilometre.

[6] It has not been possible to obtain details of the study beyond those provided by the Manual.

In a study of the benefits from restoring aquatic ecosystems in upland areas damaged through acidification Ecotec Research and Consulting undertook a CVM exercise involving 2200 people interviewed in 1993 (Ecotec 1994). 1600 of these were non-users while 600 were users including anglers. Respondents were presented with a scenario described in words, maps and pictures the nature and extent of the damage to upland aquatic ecosystems. The payment vehicle was an increment in water rates and non-users were willing to pay an additional annual £30.47 towards restoration. Users WTP was £42.20 and within this group anglers were WTP £46.54.

Davis and O'Neill (1992) surveyed 700 anglers in Northern Ireland during the 1988 season. They used a discrete choice approach where each respondent is presented with a single bid and a 'yes' or 'no' response. The probability of a 'yes' will be greater than 0.5 if a majority of the population believes that purchasing at a given price would increase their utility. The probability of a positive response will decrease as the price offered declines. By fitting an ordinary least squares equation to the responses one can find the price at which the estimated probability of a positive response is 0.5. This bid is median WTP. The results suggest that anglers in the Province enjoy some consumer's surplus. For anglers who had purchased permits in the previous year the median bid was £44.80 (25% above the prevailing price). Unfortunately the median bid of £32.39 for those who had not purchased a permit was outside the range offer and had to be extrapolated.

Willis and Garrod (1999) estimated the benefits to anglers and other users from increasing flows along seven low-flow rivers in the South West of England. Anglers were presented with an open-ended contingent valuation. The payment vehicle depended on whether the individual angler was a member of a club (increase in annual fees); syndicate (increase in rod fees); day ticket purchased (increase in ticket price). Anglers were also asked how many additional days they would purchase if the flow were restored to some environmentally acceptable flow regime (EAFR). The benefits of EAFR to informal recreational users were estimated through stated preference and contingent valuation. The non-anglers recreational users were contacted through a stratified sample of 750 households in the South West with interviews taking place in the homes of respondents. In addition 721 interviews were undertaken on river banks on a next person to pass basis. The survey suggested that anglers were willing to pay £76.40 per year for improved fishing through low flow alleviation. They would also spend, on average 17.9 more days fishing. Anglers were willing to spend £4.26 per day for EAFR. Estimates of the present value of aggregate angling benefits (6% discount rate) were produced for the seven rivers

Table 3-2 Present Value of Aggregate Angling Benefits for Seven Rivers

River	Present Value
Allen	£327,000
Upper Avon	£317,000
Meavy	£102,000
Otter	£737,000
Pidle	£214,000
Tavy	£368,000
Wyle	£583,000

Source: Willis and Garrod (1999)

In only two of the rivers do the anglers benefits outweigh the costs of low flow alleviation, (rivers Meavy and Wyle). Inclusion of other recreational benefits generates total benefits in excess of costs in three other rivers (Avon, Piddle and Allen).

Gibb Environment (1999) used CVM in an assessment for the Environment Agency of the economic impacts of proposed changes in Net Limitation Orders and associated by-laws for the River Lune. Constraints and other requirements of the study meant that only "ball-park" figures for consumer's surplus could be produced. The best estimate of consumers' surplus per trip was £10. It was felt that because of the various biases and strategic responses the true best estimate was probably greater than £10 per trip. Given 14,000 fishing days per year annual consumer surplus was £140,000. This was added to an economic rent estimate of £400,000.

In the UK there has been no estimation of anglers option value or the existence and bequest values of fish stocks. A number of studies have sought to estimate the (non-angling) use and non-use values of changes in **water quality and flow.** One of the earliest studies was conducted by Tapsell et al. (1992) in an assessment of three options for improving the aesthetic appearance of the Ravensbourne River (Kent) in Queen's Mead Recreational Ground. Respondents were asked their qualitative views and then their WTP for three options. Nearly half of the respondents could not or would not answer the WTP questions. In a study of inland waterways, Adamowicz et al. (1995), used an open ended CVM format to estimate a mean household WTP, embracing use and passive use values of canals.[7] The scenario presented was a switch by from a 'high' to a 'lower level maintenance option'. Multiplying the household WTP of £7.84 by the number of households in Great Britain yields an aggregate preservation value of £168.08m; a sum, which greatly exceeded the £59.77m grant in aid, paid to British Waterways to cover its revenue shortfall. Green and Tunstall (1991) in a study of water quality improvement surveyed three categories of individuals: users, adjacent residents and this living away from accessible river corridors. The last category approximate to non-users; however they were unable satisfactorily to separate use and non-use WTP such that the results could be tested through validity checks.

In an important study, Garrod and Willis (1996) also sought to estimate use and non-use values for low flow alleviation on the River Darent in South East England. Estimates of user values were based on a sample of 325 household residents along a stretch of the Darent and 355 visitors sampled on a next-to pass basis. Non-use values were obtained from a sample of 758 household up to 60 km from the River Darent. The payment vehicle was an increase in the annual water rate. On average residents were willing to pay £11.44 more per annum to maintain current flow conditions. The comparable figure for visitors was £8.04 and £4.32 for non-users. The population of local residents was (i.e. within 2km) was obtained from census data. The visitor population was based on the observed visit rate from the next to pass survey. The non-user population was the non-visitors living within 60km of the river. On aggregation, non-users, residents and visitors were willing to pay £14.47m more per annum to maintain current flow.

In the UK, CVM has been used extensively to value other **non-water amenity assets** such as a National Parks (Bateman and Langford 1996); preservation of wildlife (Willis 1990); access to urban fringe woodland (Bennet et al, 1995); a wildlife enhancement scheme (Willis et.

[7] They also applied stated preference, however this generated overestimates of WTP. TCM was used for those visitors who made trips to canals.

1996) afforestation programmes (Hutchinson et al 1997); coastal protection (Whitmarsh *et al.* 1999); conservation of coastal resources; Goodman et al., (1998); environmentally sensitive areas (Willis et al., 1995).

In the USA, early examples of CVM applied to recreational fisheries total use values include Usher (1987); Smith *et al* (1978); Connelly and Brown (1991). Daubert *et al* (1981) assessed the sensitivity of angler user values to changes in flow conditions on the Poudre River, Colorado. Bishop *et al.* (1987) sought to estimate non-use values for bald eagles and the striped shiner in Wisconsin. The latter species is a minnow that prefers clear streams with moderate to high gradients and gravel bottoms. Striped shiners range from 3 to 7 inches in length and there are no known methods for angling. The striped shiner is only a Wisconsin endangered species; it is relatively abundant elsewhere. The taxpayers of Wisconsin had barely heard of the striped shiner, yet they estimated a WTP of £11.59m per year to preserve a fish they would probably never see! For good reasons, the authors suspect some embedding effects, though they speculate that existence values for even obscure species may be substantial.

3.2.3 Concluding Remarks

From the initial theoretical discussion, the important user values[8] are anglers consumers' surplus and anglers option value. Passive use values of fish stocks, and option values relating to passive use, are unlikely to be significant (since fish are not easily viewed). In UK, there has been a number of studies of anglers WTP and/or consumers' surplus. All of the TCM work has been concerned with total current value and has not addressed the sensitivity of value to changes in stock abundance, catches or other characteristics of the fishery. Some of the CVM studies have filled in a few gaps, particularly FWR (1996); however anglers option values remain obscure, both in terms of its magnitude and sensitivity to change in fishery characteristics.

The existence and bequest values of fish stocks are the relevant non-use values relating to fish stocks (existence and bequest values of angling are only a remote possibility). Whilst there have been a few studies of non-use values in relation to changes in water flow and/or quality, there has been no UK work on the non-use values of fish stocks themselves.

3.3 Impact Studies

In the public domain the expenditure of anglers and the employment generated through the provision of angling services is often used for advocacy purposes. Unfortunately, in many instances the findings of an impact study are often cited and used inappropriately. This inappropriate use may be deliberate but may also be simply misguided. Both culpable and innocent misuse is best tackled by ensuring that all sides are familiar with the scope and limitations of impact studies. It is therefore important initially to examine the relevance of angler's expenditure for resource allocation decisions.

3.3.1 Impact Studies and Resource Allocation

It must be said that there is no necessary link between total anglers' expenditure (i.e. expenditure on fishing rents and permits, accommodation, travel, meals etc) and the net

[9]These user values arise from the exploitation of a combination of natural resources (fish stocks, surface water flow and quality, riparian land etc)

economic value of the recreational fishery. If, because of, say, road closures an open access fishery became more inaccessible and anglers' travel expenditure would increase. Consumers' surplus would decrease, because anglers would now be required to pay more for their fishing (while their WTP has presumably remained unchanged). Net economic value would decrease because more of society's scarce resources (such as fuel) would now be used by anglers to produce recreational experiences of the same quality.

Nevertheless, given the axiom that anglers do not make actual payments greater than their willingness to pay, total anglers' expenditure can be regarded as indicating the lower boundary of gross economic value. Note, however, that in this context incidental expenditure on goods and services that yield satisfaction independent of the fishing experience itself (meals and drinks, gifts etc) should, strictly speaking, be excluded. Also, changes in anglers' expenditure over time might well indicate an underlying increased willingness to pay for angling. For example, if the quality of angling improved or if there was an increased participation in the sport then this might lead to an increase in total expenditure. However, caution would need to be exercised in interpreting such information, since any increased expenditure might simply reflect a change in prices (of fuel, for example, or the price for fishing of a given quality) rather than an increase in willingness to pay.

Of course, anglers' expenditure may be relevant as a measure of some concept of value other than economic value. In the media, for example, the 'value' of an industry is often quoted as the annual total of consumers' spending on its products. Such figures, however, are really only a measure of 'size' and do not relate meaningfully to any concept of 'value'. Even then, they are total figures and are therefore not very helpful to decision makers. The devotion of even more resources to an industry cannot be justified simply because that industry is already large. It should also be reiterated that expenditure totals are gross measures and so ignore what is foregone in producing the given output rather than some other.

We assert that as a measure of the economic value to society of the recreational fishery, total anglers' expenditure is of doubtful relevance. Although expenditure could arguably relate to some other concept of 'value', such concepts have limited meaning and usefulness. However, as a measure of 'size', perhaps in order to make comparisons with other activities, a case could be made for estimating total anglers' expenditure.

The **impact** of anglers' expenditure on incomes does, however, warrant consideration, although care is needed in generalising about such impacts. In particular, it is necessary to distinguish between impacts at the national and regional (or local) levels.

Impact of Angler Spending at the National Level

Anglers' expenditure may have little impact on national income. In the hypothetical case of a country that did not engage in international trade and did not receive anglers from overseas, the demise of angling would only mean a shift in the pattern of expenditure and incomes within the national economy. In such a 'closed' economy, losses in incomes to tackle suppliers, hoteliers and others would largely be counterbalanced by increased incomes in other sectors to which expenditure was diverted. In this extreme case, the overall level of income in the economy cannot be dependent on the expenditure of anglers. On the other hand, if the distribution of national income was considered to be important, some significance might be attached to a loss of income in depressed regions even if there were compensatory increases in other, more prosperous, regions.

Relaxing the assumptions of no international trade and no anglers coming from overseas, attention should only be focused on the spending by visiting anglers, i.e. expenditure which is exogenous to the national economy. Domestic (endogenous) expenditure is only relevant if, as a result of a change in the fishery, some domestic anglers' spending would then be diverted to products from overseas. Total expenditure is therefore not the relevant parameter.

Impact of Angler Spending at the Regional Level

A stronger case can be made for quantifying anglers' expenditure from a regional perspective. This is because a significant component of the total anglers' expenditure within a region may be exogenous to that region. In estimating the impact on a region's income, therefore, it is necessary to quantify the proportion of total spending that originates from outside the region.

The full effect on regional income of expenditure by visiting anglers is typically greater than the magnitude of that expenditure. Visiting anglers' expenditure increases the incomes of the local businesses who sell goods and services to anglers (eg. hotels, fishing right owners, tackle shops etc). Following Martin (1987), this is the direct impact which increases the value added of local firms (value added is defined as gross revenue less inputs purchased from other firms). If these local firms purchase some of their inputs locally they then create an indirect impact on the value added of other local firms. Additional indirect impacts may also result. The direct and indirect impacts together result in an overall increase in the total of local value added. Since value added represents the sum of wages, rents and profits, an increase suggests that local household income is enhanced. To the extent that local households spend some of this extra income on local goods and services an induced effect is then impacted on local firms. Taken together, all the indirect and induced effects are referred to as secondary impacts.

Regional multipliers summarise the overall effects of both direct and secondary impacts. The actual value of a regional multiplier will depend on such things as inter-firm linkages within the regional economy, taxation policy, and the proportion of local income normally spent within the region. We should also note that, expenditure impacts are total figures and are accordingly limited in their usefulness. The estimation of more important marginal changes in the magnitude of regional visiting anglers' expenditure could present considerable theoretical and practical difficulties. Estimation of the sensitivity of visiting anglers' spending to changes in the status of regional fisheries would require the identification of functional relationships between the quality of a region's angling opportunities and the visitation rates and expenditure patterns for both 'home' and 'visiting' anglers.

Angler Expenditure: Conclusions

Anglers' expenditure is not a recognised measure of value. Anglers' expenditure does, however, provide a measure of 'size', and may be useful in making comparisons with other activities. The impact of visiting anglers' expenditure on the level of national income is negligible. Whilst the impact of visiting anglers' expenditure on income in particular regions may be significant in some cases, estimation of marginal changes could be difficult.

3.3.2 Employment Impacts

Labour employed in fisheries and ancillary services should be regarded, from society's point of view, as an economic cost. Usually one would attempt to minimise costs, and private firms certainly seek to reduce labour costs. In the public domain, however, 'job creation' (associated

with tourism, for example) is often considered to be desirable and therefore worth promoting. How can one reconcile labour being a cost in economic analysis and job creation being a heralded as a desirable aim of policy?

The first point to make is that the desirability of job creation (and the magnitude of opportunity costs) depends crucially on the circumstances prevailing in labour markets. If a fishery were closed in an area with excess labour demand, workers released from the fishery would probably be re-employed in other local activity. In this circumstance, labour used in a fishery precludes alternative uses and quite properly labour usage is a cost to be minimised and 'job creation' should not be a policy aim. Here the market wage rate is the appropriate rate at which to cost labour and shadow-pricing is not relevant.

Even if there was an excess supply of labour locally, in the longer run there might be some compensating increases in employment elsewhere in the economy as expenditure was switched to other goods and services. If, however, there was no alternative employment locally, and if at the same time the expenditure transfer was largely from less prosperous regions to those with tighter labour markets, then inflationary pressures and decreased aggregate employment might be the consequence. It would then be legitimate to regard employment in fisheries as having a net impact on the national employment level. In addition, a case can then be made for shadow-pricing, since the use of labour in fishing society does not involve an opportunity cost in terms of foregone output. The existence of unemployment does not mean that labour employed in the fishery should now be regarded as a benefit. Rather, it just becomes less of a cost, and shadow-pricing is a way of reflecting this. There is no need to consider national employment separately if labour is shadow-priced in an estimation of the net economic value of the fishery. (To shadow-price labour and quantify employment benefits would introduce an element of 'double counting'.) However, if labour ought to be shadow-priced, but had instead (for whatever reason) to be costed at the market rate, national net economic value might be seriously underestimated. There would then be a case for separately quantifying labour employed and/or its costs, as this would provide some indication of the likely extent of the underestimation

The above discussion relates to national impacts; regional employment impacts potentially have a much greater significance, since compensatory changes in other regions can legitimately be ignored. The short run impact on the regional economy would approximate to the number of jobs lost, with the impact in the longer run being determined only by conditions in the local labour market.

3.3.3 Review of Applied Fisheries Impact Studies

In the UK many of the impact studies have concentrated on salmon and sea trout fisheries. These fisheries are located in the more remote regions and may attract anglers from a very wide catchment area and many angling trips involving overnight stops. Scotland and Ireland even manage to attract visitors from overseas whose primary motive for travel is game angling. The perception therefore is that salmon angling may impact on local income and employment. Sea angling and coarse fishing generally involve anglers fishing within their local region.

In an early desk study on salmon angling Lund (1978) estimated the impact of salmon anglers' expenditure on the total UK income to be £53.4 million, which accrued to riparian owners, tackle suppliers, suppliers of meals and accommodation, travel services and distributive services. Income for each of these sectors was estimated by subtracting the value of purchased

inputs from the gross revenue they received from anglers. The resultant estimate is of the proportion of anglers' expenditure which ended up in the form of wages, rents and profits. (Gross revenue minus purchased inputs is a measure of value added.) Lund commented that in the long term the demise of salmon angling would simply result in a different pattern of expenditure and income, and that the net loss in total income might be fairly small. It was concluded that the long run impact of salmon anglers' expenditure at the national level was not very significant. Understandably, there was no attempt to examine the sensitivity of spending to changes in angling quality

Radford et al (1991) in a study for the Ministry of Agriculture Fisheries and Food estimated expenditure by salmon and sea trout anglers in England and Wales. Data were collected from a random sample of 6,290 anglers fishing in each of the relevant NRA regions in 1988. The gross expenditure made by *visiting* anglers in each region is given below. In order to appreciate the regional total impacts of these expenditure estimates, appropriate regional multipliers should be applied.

Table 3-3 Gross Expenditure Made by Visiting Anglers in Each Region

NRA Region	Environment Agency Region	Visiting Angler Gross Expenditure
Northumbrian	North East	£150,000
Yorkshire	North East	£18,000
North West	North West	£571,000
Severn-Trent	Severn-Trent	£32,000
Southern	Southern	£119,000
South West	South West	£2,450,000
Wessex	South West	£220,000
Welsh	Welsh	£3,923,000

Source: Radford et al (1991)

The estimated total gross expenditure by salmon and sea trout anglers in England and Wales in 1988 was £26.9m. In order to estimate the total *impact* of salmon angling for England and Wales as a whole (using an appropriate multiplier) it is necessary to focus on the expenditure by anglers from outside the country. From the survey responses, it was estimated that excluding their travel costs (likely to have been incurred largely outside England and Wales) these anglers visiting England and Wales spent an estimated total of £131,000.

At a regional level, Harris (1983), in a report to the European Parliament Agriculture Committee Working Group on Fisheries, speculated that the gross expenditure on salmon and sea trout angling in Wales might have been in the region of £20.5m to £30.8m. In a study of angling in South Wales (Usk and Glamorgan River Divisions), Mawle (1983) estimated expenditure by residents of the region to be £451,220, 10% of which was on salmon angling. Anglers from outside Wales were estimated to spend £205,100 and it was considered that the majority of this expenditure would have been associated with salmon angling.

A few expenditure studies have focused on individual river systems. Randerson et al (1978) estimated the gross expenditure associated with all angling in the Wye River Division in Wales to be £36.47 million, with 30% of this attributable to salmon angling. Gee and Edwards (1982) subsequently amended this estimate to £11.05 million for salmon anglers on the River Wye. Radford (1980) estimated expenditure by salmon anglers on the River Wye to be only £2.84 million with about two thirds of this total being spent by non-Welsh anglers. In another single river study, Mawle and Randerson (1983) estimated the gross expenditure of salmon

anglers fishing on the River Usk to be £172,000 with £156,000 of this being incurred by non-Welsh anglers. No multipliers were applied to the expenditure totals in any of these assessments.

With respect to England and Wales and species other than salmon and sea trout Dunn *et al* (1989) in a study for the Ministry of Agriculture Fisheries and Food estimated the annual expenditure of bass anglers in England and Wales to be £27.1m. Their judgment is that this is possibly an underestimate and stress that these expenditures do not reflect the economic value of the fishery. Indeed, this is a sea fishery and is thus open access and none of the expenditure relates to purchasing access to the fishery. In a later study which revised and extended the 1987 work Dunn *et al* (1995) re-estimated the 1987 gross expenditure at £16.6m. Expenditure in 1992 was £22.75. The revisions were undertaken because of doubts about the earlier estimate of the total number of bass anglers in England and Wales.

Cobham Resource Consultants (Anon 1983) estimated the total expenditure by all anglers in England, Wales and Scotland in 1982 to be some £1,390 million. Assuming an expenditure multiplier of 1.8 the total impact of direct and indirect angling expenditure to be £2403 million. This provides a description of the size of the activity, but provide no assistance with resource allocation decisions. A similar study by Cobham in 1992 estimated direct expenditure in Great Britain to be £1364, indirect expenditure £1,122 with a total expenditure of £2,486 Cobham Resource Consultants (Anon 1992).

More recently, Moon and Souter (1994) generated expenditure data in a study for the NRA into the number and demographic characteristics of anglers. Defining an angler as someone who had been fishing in the previous two years, they estimated a population of 2,904,000 anglers in England and Wales. This population included 2,2961,000 who had participated in coarse anglers and 842,900 who had participated game anglers[9]. In estimating angler expenditure they focussed only on those anglers who fished in the pervious year. The 1.93m English and Welsh coarse anglers who fished in the previous year spent a total of £2.54billion. Of this, £96m was spent on permits to enable these anglers to fish particular stretches of water. The 0.7m Game anglers in England and Wales spent total of £0.98 billion in the previous year, of which £8.1m was spent on permits.

Outside England and Wales, the Tourism and Recreation Research Unit of Edinburgh University estimated the expenditure made by salmon anglers in Scotland during 1981-1982 to be some £74.56 million (Anon 1982). Mackay Consultants (Anon 1989) estimated the direct expenditure of all salmon anglers in Scotland to be £51.24 million. Assuming a multiplier value of 1.5, the total expenditure in Scotland which was derived from salmon angling (the sum of direct, indirect and induced expenditure) was estimated to be £76.86 million. The 'Mackay' estimate and the TRRU estimate are remarkably similar. Strangely, within this total no distinction was made between the impact of visiting anglers' expenditure and that of resident Scottish anglers' expenditure on the Scottish economy (see Martin 1987 and Propst and Gavrilis 1987 for a discussion on the importance of such a distinction when using multipliers). The assumption was made that every £22,875 of direct, indirect and induced expenditure by visiting and Scottish based anglers would generate one full-time job equivalent. The justification for not distinguishing between home based and visiting anglers is not given. Employing this assumption it is estimated that 3,360 jobs were generated by the expenditure of salmon and sea trout anglers. On a pro rata basis, 2,240 of these jobs would implicitly be generated directly by anglers' expenditure in the provision of angling-related

[9] 1,104,400 participated in sea angling and many anglers engaged in more than one form of angling

services such as tackle, travel, accommodation, and food and drink. The remaining 1,120 jobs would be dependent on the further round expenditure made by those supplying services to anglers.

More thorough work on the impact of salmon anglers' expenditure has been conducted in the Republic of Ireland, O'Connor *et al* (1974) conducted an extensive survey of salmon angling in Ireland. In calculating the impact of anglers' expenditure on the Irish economy these authors distinguished clearly between visiting anglers and Irish anglers. They estimated that anglers visiting from outside Ireland, coming specifically in order to fish for salmon and sea trout, spent a total of £2.76m. In estimating the net impact on the Irish economy (the contribution to GDP as measured by value added), O'Connor et al gave some attention to how visiting anglers' expenditure data should be manipulated. They considered that to calculate income dependent upon expenditure by visiting anglers, the costs of inputs purchased from outside Ireland (eg. petrol) should be deducted. In other words, value added (as estimated by Lund, op cit) should be calculated. From their survey data they estimated that 25% of visiting anglers' direct expenditure was on imported goods and services.

O'Connor et al (op cit) then pointed out that value added calculated in this way ignores the fact that if there were unemployed resources and spare capacity the 75% of visitor anglers' expenditure remaining within Ireland (in the form of value added) would generate further economic activity and further value added. Allowing for the proportion of all value added removed by taxation and the proportion of first round value added that would be spent on imported goods, they estimated a multiplier value of 1.6. This means that every IR£1 spent by visiting anglers would generate an increase of IR£1.60 in household income within the Irish economy. Since these anglers visit Ireland for the specific purpose of salmon angling, the estimate of £4.3m for total value added represents an approximation to both the implied short run and long run impacts on Irish household income that would arise from the elimination of salmon angling.

Total expenditure by Irish salmon anglers was estimated in this study to be £1.69m. However, since this expenditure was endogenous to the Irish economy, the application of a multiplier was not considered to be valid. It could well be argued that expenditure by domestic anglers, whether multiplied or not, is not strictly relevant in this type of impact assessment. This was essentially the view of Lund (op cit) who suggested that in the longer run total domestic expenditure would be largely unaffected. However, since in the absence of the fishery some Irish salmon anglers' expenditure might have been diverted to outside Ireland, the exclusion of domestic expenditure would result, to a greater or lesser extent, in an underestimation of salmon angling's contribution to the total Irish GDP. O'Connor et al adopted the expediency of assuming that value added was equal to the un-multiplied total of domestic anglers' spending. The sum of the value added from domestic and visiting anglers' expenditure was therefore estimated as £5.99m

O'Connor (1983) updated and amended the results of the earlier study. He estimated the value added associated with visiting anglers' expenditure as IR£5.16m. After allowing for the import content of visiting anglers' expenditure and applying a revised multiplier of 1.3 the contribution to GDP from visiting salmon anglers was estimated to be IR£4.93m. The value added through domestic anglers' expenditure was estimated as IR£2.19 m. This was calculated by subtracting from domestic anglers' expenditure an estimate of the import content in the goods purchased. Overall, it was estimated that salmon and sea trout anglers' expenditure contributed some £7.12m. to Ireland's GDP in 1982.

Whelan and Marsh (1988), in a similar study of all Irish angling, estimated that visiting (game, sea and course) anglers spent a total of £32 m. whereas Irish game anglers spent £33m They estimate that 1,900 jobs Ireland were dependent on visiting anglers spending. However, Whelan and Marsh (op cit) identified visiting expenditure as the important component in calculating employment impacts, and estimated that in Ireland £22,289 of tourist anglers' expenditure was required to generate each additional new job.

3.3.4 Concluding Remarks

Angler expenditure is a descriptive measure of size and of itself has no relevance for resource allocation. Whilst, the impact of angler expenditure on employment and incomes at the national level is insignificant, at local level there may be employment dependency. Care needs to be exercised in integrating these regional distributional issues into resource allocation decision.

4 CASE STUDIES

4.1 Introduction

This section presents the main findings of the Phase 1 Case Studies and briefly assesses the economic values associated with the fishing activity and fish stocks in the three target areas.

The full results of the case studies can be found in Spurgeon, J., et. al. (1999) "*Economic Evaluation of Inland Fishing in England & Wales. Case Study Reports: Thames, Teifi and Leeds.*"

4.2 Results

The initial results of questionnaire responses in the three different Case Study regions are shown below.

Considerable caution should be taken over the use of the values calculated due to the fact that:

- The sample sizes used are small, particularly for valuing such complex issues.
- The results of contingent valuation studies are contentious.
- Consumer surplus can be added to expenditure to give a measure of total willingness to pay; though not net economic value.
- The benefits of the Thames results will extend to a greater catchment area than the Thames Region alone.
- The Leeds sample is biased towards young anglers and those who are active outside of the main fishing season.
- The expenditure calculated in the Teifi and Leeds studies is gross expenditure, not net income.
- The Teifi sample is biased towards enthusiastic and retired anglers.

4.2.1 The River Thames: The Existence Value of a Salmon Fishery

The Thames telephone survey asked members of the general public living in Thames catchement area:

"To ensure that salmon do eventually live and breed again in the Thames Region, would you be willing to pay any money towards a Trust Fund to help achieve this ?"

If they responded positively to this question, they were then asked:

"Bearing in mind your financial constraints and the other things you would like to spend your money on, which of the following would be the maximum amount you would be willing to pay each year to such a trust fund ?"

For the purposes of this study, the best estimate WTP value of responses is taken as £2.40 per household per year (the 5% trimmed mean rounded). Assuming 5 million households in the Thames Region, then, there may be a potential economic value of introducing living and breeding salmon to rivers in the Thames Region of £12 million per year with a high and low

estimate (simply based on half and twice the assumed WTP value) of £6 and £ 24 million respectively.

The majority of respondents regarded '*Improving the environment in general*' and '*Improving the water/environmental quality of rivers*' as very important. The Thames was most frequently used for walking, jogging and bicycling. In response to being asked how much enjoyment they would receive relating to various factors if there were salmon in the river Thames, respondents indicated that most enjoyment would be derived from 'Knowing it meant that the rivers were clean' followed by 'Knowing that future generations would benefit (a form of Bequest value)' and 'Just knowing that there are salmon in the rivers (a form of Existence value)'.

4.2.2 The Afon Teifi: The Value of Angling to Rural Communities

The Teifi Case Study questioned anglers on their direct, indirect and additional expenditure within 25 miles of the Teifi, in Dyfed and other areas. The analysis of results is shown below:

Table 4-1 Summary of Total Expenditure Relating to Angling on the Teifi

Type of Expenditure	Withn 25 miles of Teifi (£/yr)	In Dyfed (£/yr)
Direct	190,000	16,000
Indirect	380,000	15,000
Additional	260,000	16,000
Total for salmon & sea trout	**830,000**	**47,000**
Total for all fishing	980,000	56,000
Total incl multiplier effect	**1,100,000**	**60,000**

The total expenditure on game fishing was estimated at £830,000 This is the sum of the direct, indirect and additional expenditure on fishing by the anglers. The total expenditure for all fishing is simply 15% more than that spent on game fishing, i.e. £980,000, this is derived from the estimate that 85% of fishing days are targeted at Game while 15% are targeted at other species. The multiplier effect that the total investment has magnifies the actual impact, from fishing, on the local economy to an estimated £1,100,000. Estimated annual expenditure of Teifi anglers directly related to angling was £605/angler with the major expenditures being on licence, fees and permits (47%) and fishing equipment (44%).

For the purposes of this study, the consumer surplus relating to each fishing trips on the Afon Teifi is based on anglers' "*maximum willingness to pay (WTP) to guarantee that the angling will always be as good and as accessible as it is now*".

The best estimate WTP value is taken as £7.50 per trip, the 5% trimmed mean. When multiplied by the number of annual fishing trips made to the Teifi this would give a total consumer surplus of £70,000 per year with low and high estimates of £30,000 and £140,000 respectively.

4.2.3 Fisheries in Urban Leeds: The Value of Angling to Urban Communities

Leeds respondents were asked "*Bearing in mind your current angling costs, the number of trips you make and your other financial needs, what would be the maximum extra amount of*

money you would be willing to pay each day you fished in Leeds to guarantee that the fishing would always be as good and as accessible as it is now ?".

For the purposes of this study, the best estimate WTP response to the above question value was taken as £1.80 per trip, the rounded 5% trimmed mean. Total consumer surplus was calculated as £260,000 when multiplied by the average number of trips made by Leeds fishermen to Leeds urban areas. This value may be enhanced if other anglers are attracted into the Leeds urban area by good catch rates.

Estimated annual expenditure of Leeds anglers directly related to angling was £600/angler with the major expenditures being on license, fees and permits (12%), fishing equipment (69%) and competitions (19%).

The case study results and other qualitative information indicate that angling in the Leeds urban area is a social activity where 'being with friends' is ranked the second most important reason for fishing and 'solitude' is the second least important factor when fishing. Many angling clubs area based at social clubs, pubs or places of work. The survey results suggest that fishing plays an important social, communication and relaxation role in the lives of respondents, who are mostly adults and nearly all male.

Fishing is also an important activity for young people. Training and competitions are highly organised for young anglers in the Leeds area and it is apparent that one motivation for organising such activities it to '*Get hooked on fishing, not drugs and crime*' (to borrow the title of an annually organised fishing competition in Leeds). Encouraging respect for the environment is also important as demonstrated by the introduction of a Scout Association proficiency badge promoted as a "*way of developing greater environmental awareness*".

Disabled anglers are active in Leeds, with 410 members of L.D.A.S.A. (full title) though activities are limited by access problems to, and on, some fishing sites.

4.3 Issues for the National Surveys

Key issues with respect to the Case Study survey results and methodologies to be considered in the Phase 2 National Surveys were as follows:

- **Self-selection bias.** There was a tendency for the mail survey respondents to be biased towards particular traits. For example, there were biases towards the old and retired (who generally have more time on their hands) and the young (who are organised by motivated individuals) and also towards the more enthusiastic anglers who are active, both with fishing and club activities, outside of the main summer season.
- **Incorrect data.** Responses relating to expenditures were probably exaggerated, given that individuals are likely to think they will benefit more if they inflate the value of angling activities to local economies.
- **Responses completed incorrectly.** Some responses were not completely filled in. This reduces the ability to derive sensible data, in particular for sub-samples.
- **Type of analysis.** Mean WTP is sensitive to the way in which it is calculated. For example, in the Leeds analysis, adjusted WTP per day derived from the mean values given by anglers regardless of the number of days they spent fishing in the Leeds urban area was calculated to be £ 2.09/day with a 5% trimmed mean of £ 1.76/day. Repeating this

analysis, but weighting the WTP by the number of days spent fishing in the Leeds urban area gives a WTP of £1.60/day with a 5% trimmed mean of £1.26/day. The difference in results is explained by the fact that the responses from anglers who fish much of their time in the Leeds urban area are 'masked' by the responses of anglers who fish less often in this area, unless relative differences in activity are incorporated into the analysis.

- **Validity of results.** The reporting of the case study results has been limited to only one form of reliability testing, using of correlation coefficients to assess the relationship between two properties (i.e. individual variables and WTP). However, regression analysis is a more appropriate means of testing contingent valuation results for reliability. This form of analysis assesses the relationship between a dependent variable (WTP) and a range of independent variables (e.g. income, age). From this it is possible to determine a linear equation that can then be used to predict the value of the dependent variable.

  Although regression analysis was undertaken for the Thames and Teifi case studies, the results were poor (with adjusted R square values (correlation) of less than 0.15), reflecting the small sample sizes and the complexity of issues being valued. This form of assessment is more important for Phase 2 when much larger sample sizes will be used.

5 NATIONAL ANGLER SURVEY

5.1 General Fishing Activity

There were 806 respondents to the Phase 2 National Angler Survey. In Question 1 respondents were asked what type of angling they participated in within England and Wales, and how often they undertook it. Figure 5-1 presents the summary of results. The data shows that the interviewees mainly undertake coarse fishing (69% of respondents do so "usually" and 18% "occasionally"). This result is consistent with the findings of the Environment Agency (ex NRA) national angling survey 1994 study, which revealed that 79% of anglers go coarse fishing (NRA, 1994). In comparison, 17% of the respondents stated that they "usually" fish for rainbow and brown trout (26% stated they do so "occasionally"). Only 4% of respondents claimed to undertake salmon fishing "usually". Again, this figure is consistent with the finding of the 1994 NRA study. Note that the anglers who usually undertake sea angling have been omitted from the Table.

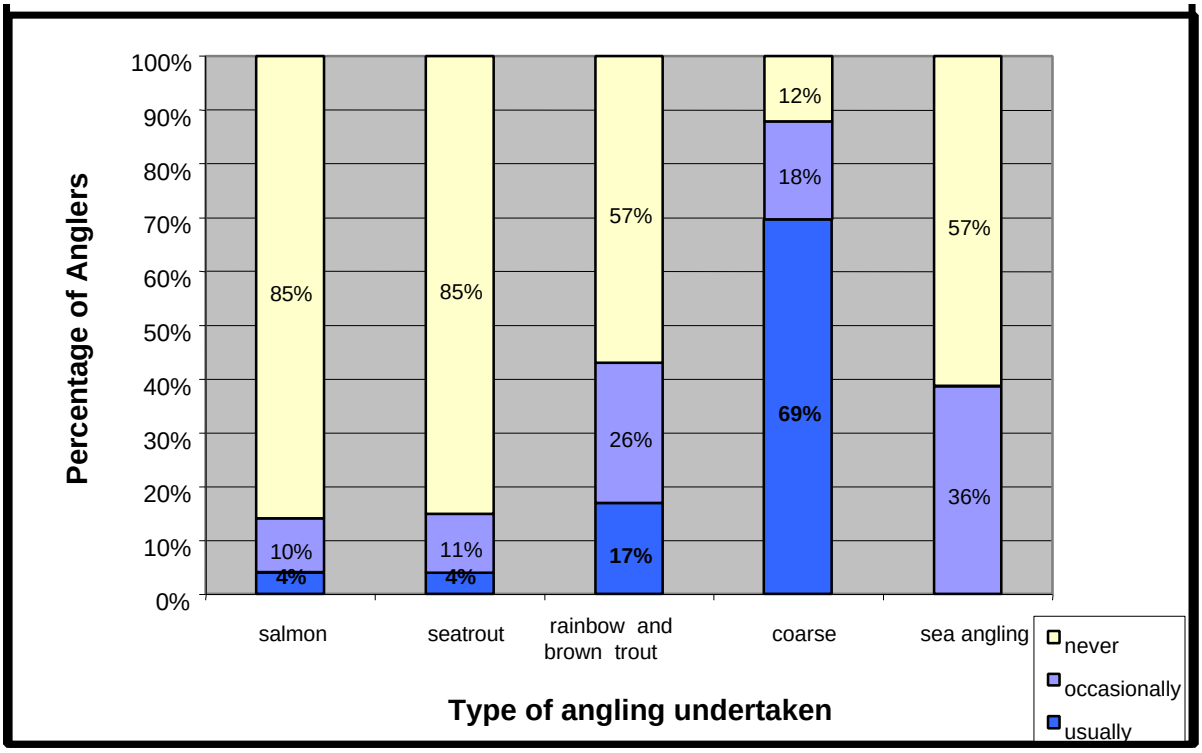


Figure 5-1 Type of Fishing Undertaken (Question 1)

An alternative way to present the data gathered in Question 1 is shown in Table 5-1. Individuals who participate either "usually" or "occasionally" in one or more of types of angling were put into sub-sets depending on what types of fishing they undertake. This is because most anglers undertake a range of different types of angling.

Table 5-1 shows that people who participate exclusively in coarse angling are the larger sub-set (222 respondents) and a considerable number of respondents (164) participate in both coarse and sea angling. The other sub-sets are made up of fairly small number of participants.

Table 5-1 Type of Angling Sets (Question 1)

Sub-Sets	Respond No	Respond %	Salmon	Sea Trout (S Trout)	Brown & Rainbow Trout (B Trout)	Coarse	Sea Angling
Brown Trout	37	5%	-	-	37	-	-
Coarse	222	28%	-	-	-	222	-
Sea Angling	2	0%	-	-	-	-	2
Salmon & S Trout	4	0%	4	4	-	-	-
Salmon & B Trout	15	2%	15	-	15	-	-
Salmon & Coarse	9	1%	9	-	-	9	-
Salmon & Sea Angling	4	0%	4	-	-	-	4
S Trout & B Trout	7	1%	-	7	7	-	-
B Trout & Coarse	72	9%	-	-	72	72	-
BTrout & Sea Angling	10	1%	-	-	10	-	10
Coarse & Sea Angling	164	20%	-	-	-	164	164
Salmon, S Trout & B Trout	24	3%	24	24	24	-	-
Salmon, S Trout & Sea Angling	37	5%	37	37	-	-	37
Salmon, B Trout & Coarse	8	1%	8	-	8	8	-
B Trout, Coarse & Sea Angling	91	11%	-	-	91	91	91
Salmon, S Trout, B Trout & Coarse	15	2%	15	15	15	15	-
Salmon, S Trout, B Trout & Sea Angling	16	2%	16	16	16	-	16
Salmon, S Trout, Coarse & Sea Angling	19	2%	19	19	-	19	19
Salmon, B Trout, Coarse & Sea Angling	14	2%	14	-	14	14	14
S Trout, B Trout, Coarse & Sea Angling	20	2%	-	20	20	20	20
Salmon, S Trout & B Trout, Coarse & Sea Angling	16	2%	16	16	16	16	16
Total	806	100%	181	158	345	650	393
Percentage	100%	100%	10%	9%	20%	38%	23%

Question 2 asked respondents: "***which of the following types of waterbodies do you fish within England and Wales? Please state whether you fish them usually, occasionally or never"*** and then listed water bodies such as Lakes, Canals, Rivers and Sea.

Figure 5-2 reports the summary results. The results show that the type of water body where most fishing activities take place is lakes (57% do so "usually" and 36% do so "occasionally"). Rivers also attract a large number of anglers (42% do so "usually" fish and 46% occasionally). Canals are used least often as fishing sites (only 16% of the interviewees "usually" fish in canals). For this question, those respondents who "usually" undertake sea angling have been omitted.

Again, these results are consistent with the findings of the Agency 1994 study, which provided data on types of water bodies fished by coarse anglers, showing that canals were most often fished by only 14% of the coarse anglers.

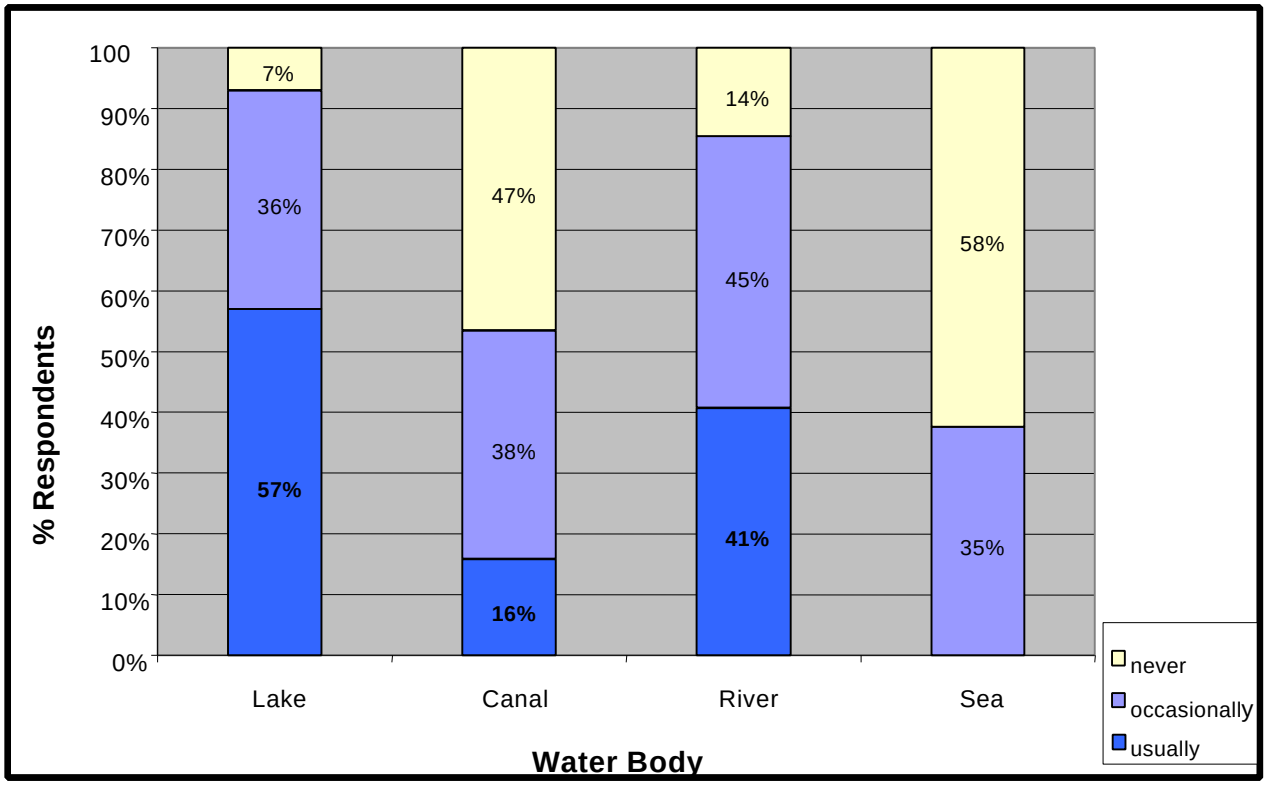


Figure 5-2 Type of Water Body Usually Fished (Question 2)

In **Question 3**, respondents were asked which type of Environment Agency licence they had purchased in the previous twelve months. Despite numerous people checking the wording in the question prior to completing the design, retrospectively it was thought that there was too much ambiguity in the wording of the question to rely on the answers given. In any case, this information is already known to the Agency.

Question 4 asked respondents**: *"which of the following fishery types, in terms of access, do you use within England and Wales? Please state whether you use them usually, occasionally or never"***. A list of fishery types was offered to the respondents, which included, public free fishery, free private fishery (fishery that is free but with restricted

access), club/association fishery, day ticket and syndicate fishery. The results are reported in Figure 5-3.

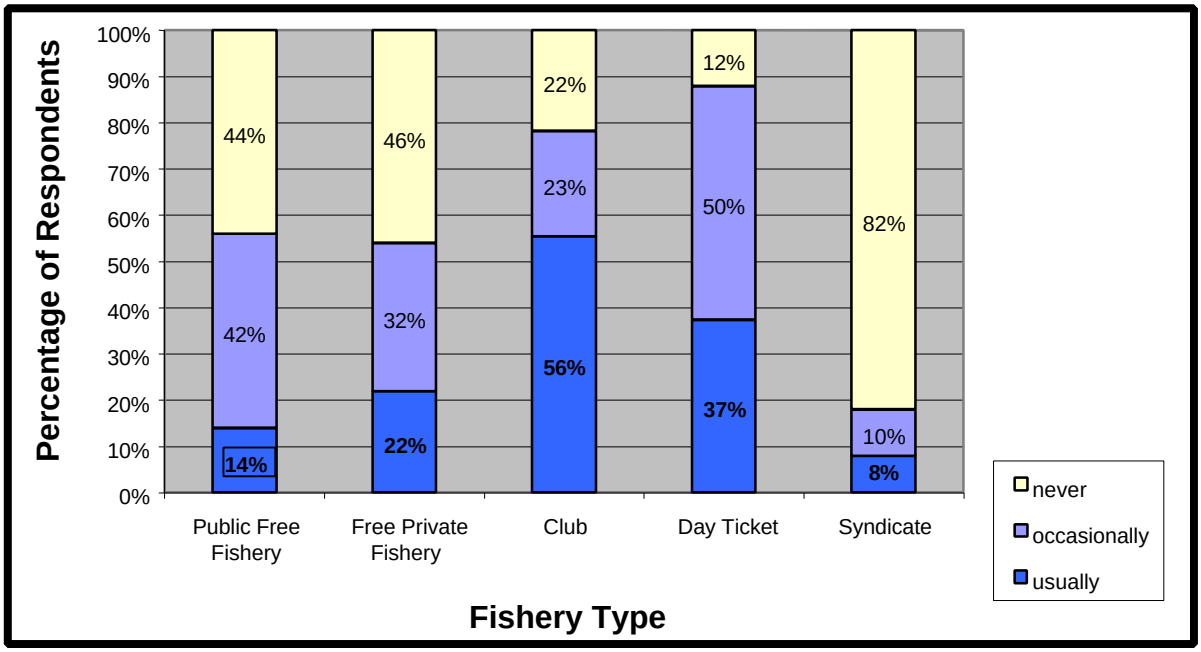


Figure 5-3 Type of Fishery Used (Question 4)

Results show that the interviewees mainly used club/association fisheries (56% did so "usually" and 23% "occasionally"), or bought daily access tickets (37% "usually" and 50% "occasionally"). Syndicates were the least common type of fishery. This result is again consistent with findings of the NRA 1994 study, which reported that over half (51%) of the anglers were members of an angling club.

Question 5 gathered information on how frequently the anglers go fishing. The results are shown in Table 5-2.

Table 5-2 Frequency of Angling Trips (Question 5)

Frequency of Angling	Coarse Anglers		Game Anglers (Salmon & Trout)	
(trips per year)	Respondents	Percentage	Respondents	Percentage
1 to 5	25	4%	11	7%
6 to 15	90	14%	29	18%
16 to 30	141	22%	52	32%
31 to 50	130	20%	32	19%
51 to 100	156	25%	27	16%
More than 100	95	15%	13	8%

From this point onwards, respondents have been split into two sub-samples, coarse anglers and salmon and trout (game) anglers. The latter includes all types of trout, not just sea trout.

Within both sub-samples, 67% of respondents stated that they go fishing between 16 (slightly more than once every month) and 100 times per year (once every three days). However, it is worth noting that coarse anglers go fishing more often than trout and salmon anglers do.

Indeed using "mid-values" (see below) for the ranges and 100 trips per year for respondents who stated to go fishing *more than 100* times (i.e. a very conservative estimate), the coarse anglers go fishing on average 48 days per year, whilst trout and salmon anglers do so 10 days per year.

Note that the "mid-value" is defined as the central value within a range of fishing trip numbers per year (e.g. in the range 1-5 trips, 2.5 is the mid-value). Each mid-value of each trip frequency in Table 5-1 has to be multiplied by the number of respondents stating that their fishing frequency lies within that range. The results of the products are then summed and divided by the number in that category to give an average value. It must be noted that this is a fairly crude means of calculation, but essential due to the nature of the telephone interview question.

Question 6 focused on annual expenditure on fishing. The question asked respondents ***"what is your average annual expenditure directly relating to your angling activities in England and Wales".*** The list of activities or commodities on which to spend money was then read out to the interviewee, and for each activity or commodity the respondent was asked to state the average annual expenditure. The break down of their total fishing budget into different expenditures is shown in Table 5-3 and Table 5-4 for coarse and game fishing respectively.

Table 5-3 Coarse Anglers Annual Expenditure (Question 6)

Expenses (£)	Angling Club and syndicate membership	Permits (weekly/ daily)	Competit fees	Bait, equipment & specialist clothing	Angling books & magazines	Food purchased on trips	Accom away from home.	Travel fares/ petrol (30p/mile)
0	25%	16%	71%	3%	33%	53%	78%	10%
1 to 25	18%	25%	5%	6%	25%	14%	1%	10%
26 to 50	23%	23%	6%	11%	18%	11%	3%	16%
51 to 100	16%	18%	5%	17%	15%	8%	3%	18%
101 to 200	9%	8%	4%	18%	5%	5%	5%	17%
201 to 500	4%	5%	4%	26%	2%	0%	6%	17%
501 to 1000	0%	1%	1%	7%	0%	0%	1%	5%
1000 to 3000	0%	0%	0%	6%	0%	0%	0%	5%
Over 3000	0%	0%	0%	3%	0%	0%	0%	0%
Don't Know	5%	4%	4%	3%	2%	9%	3%	2%
Median (£/yr)	38	38	0	150	13	0	0	75
Mean (£/yr)	64	72	54	380	37	42	52	158

Table 5-4 Salmon & Trout Annual Expenditure (Question 6)

Expenses (£)	Angling Club and syndicate membership	Permits (weekly/ daily)	Competit fees	Bait, equipment & specialist clothing	Angling books & magazines	Food purchased on trips	Accom away from home	Travel fares/ petrol (30p/mile)
0	36%	9%	88%	5%	27%	50%	72%	5%
1 to 25	7%	16%	4%	9%	28%	10%	2%	5%
26 to 50	12%	14%	1%	16%	28%	17%	3%	20%
51 to 100	18%	16%	1%	20%	8%	7%	6%	22%
101 to 200	12%	16%	1%	21%	4%	4%	8%	21%
201 to 500	8%	17%	0%	18%	0%	4%	6%	12%
501 to 1000	1%	7%	0%	6%	0%	1%	1%	5%
1000 to 3000	2%	1%	0%	0%	1%	0%	0%	0%
Over 3000	0%	0%	0%	0%	0%	0%	0%	0%
Don't Know	5%	4%	5%	5%	4%	7%	2%	10%
Median (£/yr)	38	75	0	75	13	0	0	75
Average (£/yr)	106	154	5	156	31	42	44	144

The figures in Table 5-3 and Table 5-4 show the annual average expenditure for coarse and game fishing. The evaluation of average values is carried out using mid-values (see explanation above) of the expenditure ranges. Individuals who stated “don’t know” were taken out of the calculation, thus effectively giving them an average value. The mid-values were multiplied by the number of individuals who claim to spend the amount within the corresponding range. The results of each multiplication were added together and then divided by the total number of anglers (excluding the “don’t knows”).

Median values are also provided. These values are simply the mid-values taken from the expenditure range corresponding to which 50% of the sample pay.

It is worth noting that both mean and median are evaluated based on the assumption the stated expenditure values within each category are clustered around the mid point of the range, this is not necessarily true, therefore the values reported in Table 5-3 and Table 5-4 are to be considered proxies. It is also interesting noting that the average values are rather higher then median values. This is due to the strong influence of upper tails of the expenditure distributions on the average values.

It is worth noting that, on average, coarse anglers do not spend much on accommodation. Indeed, the average annual expenditure on accommodation is £52 per year, if this information is analysed taking into account the average number of times that coarse anglers go fishing (48 trips/year), the result is an average £1.08 per trip. For game anglers, based on an average of 10 trips per year, the average expenditure on accommodation per trip is £4.40 per trip.

The mean average annual expenditure for coarse angling is £859, and the total median is £314. These figures are obtained by summing data contained in the last two rows in Table 5-3. The mean average annual expenditure for game anglers is £682 and the total median is £276.

Question 7a investigated the different reasons for people to go angling, and their relative importance. Some motives were general fishing motivations, others were more site specific. The question asked respondents to state the importance to them of various motivations by

using a range spanning from 1 to 5. In this range 1 and 2 express “no” or “small” importance of the reason prompted, while 4 and 5 represent “fair” or “high importance” of the reason, and 3 is for “neutrality” (i.e. neither unimportant nor important). The results are shown in Figure 5-4 and Figure 5-5, and Table 5-5.

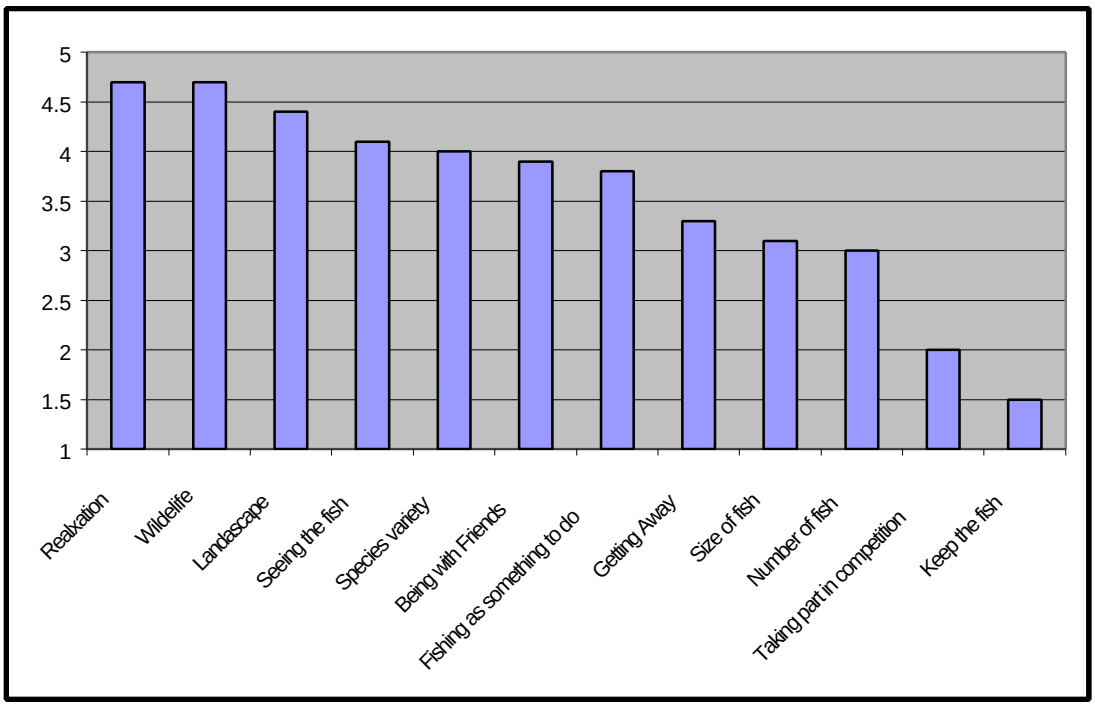


Figure 5-4 Reasons for Fishing Enjoyment: Coarse (Question 7a)

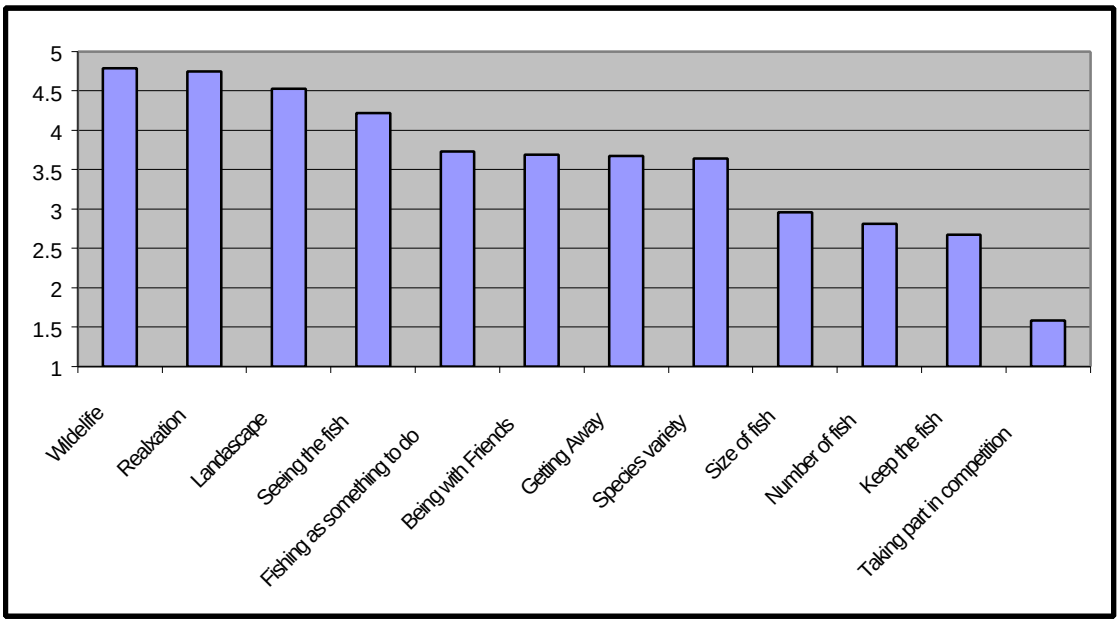


Figure 5-5 Reasons for Fishing Enjoyment: Game (Question 7sa)

The score on the y-axis is the average value of the responses. Scores greater than 3 indicate that a particular motivation is important, while scores below 3 mean that the motivations are less important in influencing the individuals’ choice to go fishing.

The three best performing motivations, for both coarse and game anglers are to relax, and to enjoy the wildlife and the landscape. Being able to see fish was also important to most anglers, and getting away from people, and being with friends both scored reasonably highly for coarse anglers.

Motivations which are strictly related to fishing as a sport activity seem to be the least important. Indeed, "competition" and "keeping the fish" score negatively (below the neutrality threshold 3) for coarse and salmon & trout anglers, and the "number of fish caught" and "size" of the fish are also considered to be of low importance. These two motivations score negatively within the salmon & trout anglers sub-sample, whereas coarse anglers stated that the number of fish caught is "neither important nor unimportant", and the size is only slightly "important" (just above the 3 threshold).

An alternative way of presenting the importance of different motivations for angling is presented in Table 5-5. This table shows the percentage of respondents who stated that a motivation is either "fairly" or "very important".

Table 5-5 Importance of Different Angling Motivations (Question 7a)

Motivations	Coarse Respondents %	Salmon & Trout Respondents %
Relaxation	96%	98%
Wildlife	96%	98%
Landscape	90%	95%
Seeing the fish	82%	86%
Being with friends	74%	68%
Fishing as something to do	73%	68%
Getting away	55%	66%
Variety of fish	80%	65%
Size of fish	50%	45%
Number of fish	45%	40%
Keeping the fish	10%	36%
Taking part in competitions	23%	11%

The ranking of motivations in Table 5-5 differs slightly from that in Figure 5-4 and Figure 5-5 since data in Table 5-5 are a sum of the respondents who stated that the reason is "very important" or "fairly important". On the other hand, Figure 5-4 and Figure 5-5 presents scores that weight the difference between the two grades of importance. Nevertheless, figures in Table 5-5 confirm the conclusion that the most important motivations for angling are not strictly related to angling itself, but more generally to bank-side features.

The last consideration has to be borne in mind for the elicitation of the average willingness to pay to maintain the "existing quality of the fishing" at the regular site (see Section 5.2). It might be that interviewees express in their WTP bids their concern for the preservation of site features other than fishing quality. This problem was actually addressed in the survey design, particularly in the formulation of the payment principle question, which asked respondents their willingness to pay for preserving the current quality at the regular fishing site. Quality was defined in terms of "fish numbers, diversity, and size" (Q.16). The words used in this question should have helped the respondents to concentrate on their WTP on maintaining fish stock numbers.

5.2 Fishing at their Regular Site

The second part of the questionnaire focused on the respondents' most regular fishing site. This scenario was chosen so that the angler was likely to know the site characteristics particularly well. In order to draw interviewees' attention on this site, a brief introduction stated that the following questions would relate *to an inland water-body in England and Wales* that the respondents fish most often.

Question 8 asked respondents ***"thinking of the site you fish at most often. What type of water-body is it?"*** Options for waterbody types were read out. Results are split into different regions and are reported in Table 5-6 and Table 5-7.

Table 5-6 Most Regular Water Body for Coarse Anglers (Question 8)

Regular Site	Overall	North West	Anglian	North East	SW/Wales	Southern/ Thames	Midlands
Lake	67%	77%	61%	63%	69%	80%	54%
Canal	10%	10%	4%	19%	7%	9%	12%
River	21%	10%	35%	16%	24%	11%	32%
Other	1%	3%	0%	2%	0%	0%	2%

Table 5-7 Most Regular Water Body for Game Anglers (Question 8)

Regular Site	Overall	North West	Anglian	North East	SW/Wales	Southern/ Thames	Midlands
Lake	65%	47%	90%	78%	49%	65%	60%
Canal	0%	0%	0%	0%	0%	0%	0%
River	32%	49%	10%	22%	51%	35%	38%
Other	1%	4%	0%	0%	0%	0%	2%

The results in Table 5-6 and Table 5-7 show that respondents most commonly fish in lakes. This is consistent with data provided in Figure 5-2, the focus of which was frequency of fishing at the different water-bodies. The game anglers of South West England/Wales are the only sub-sample whose majority fishes in river.

Question 9 asked respondents what type of fishing they usually undertook at their preferred site. Responses are reported in Table 5-8.

Table 5-8 Type of Angling Carried Out at their Regular Site (Question 9)

Type of angling at regular site	Overall	North West	Anglian	North East	SW/Wales	Southern/ Thames	Midlands
Salmon	6%	14%	0%	0%	12%	5%	3%
Trout	14%	29%	9%	10%	31%	10%	11%
Coarse	80%	64%	92%	91%	60%	87%	90%
Don't Know	0%	0%	0%	0%	0%	1%	0%

As one would expect the results reported in Table 5-8 are consistent with the data shown in Figure 5-1. Indeed, Figure 5-1 showed that 69% of respondents "usually" fish for coarse fish

and 14% fish for them "occasionally". The overall data in Table 5-8 shows that 80% of the respondents' regular sites are coarse fisheries.

Individuals were then asked ***"what is the quality of the fishery like"*** at their preferred site (Question 10). The question wording helped the respondents to focus on the fish population features. Indeed, the question defined quality "in terms of number, size, and diversity of the fish" at the site. This detailed description of the good was an important feature of this questionnaire since, as pointed out in Section 5.1, the respondents showed that they value their fishing experience for several reasons not necessarily related to the fishing itself. The results are reported in Figure 5-6 and Figure 5-7.

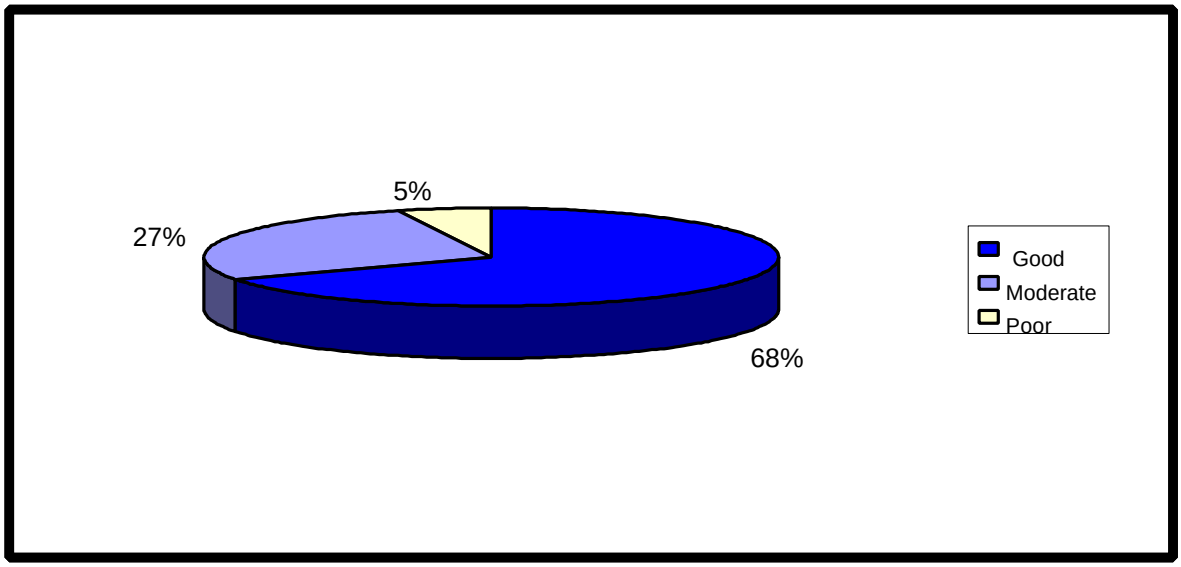


Figure 5-6 Quality of Fishery at the Regular Site: Coarse (Question 10)

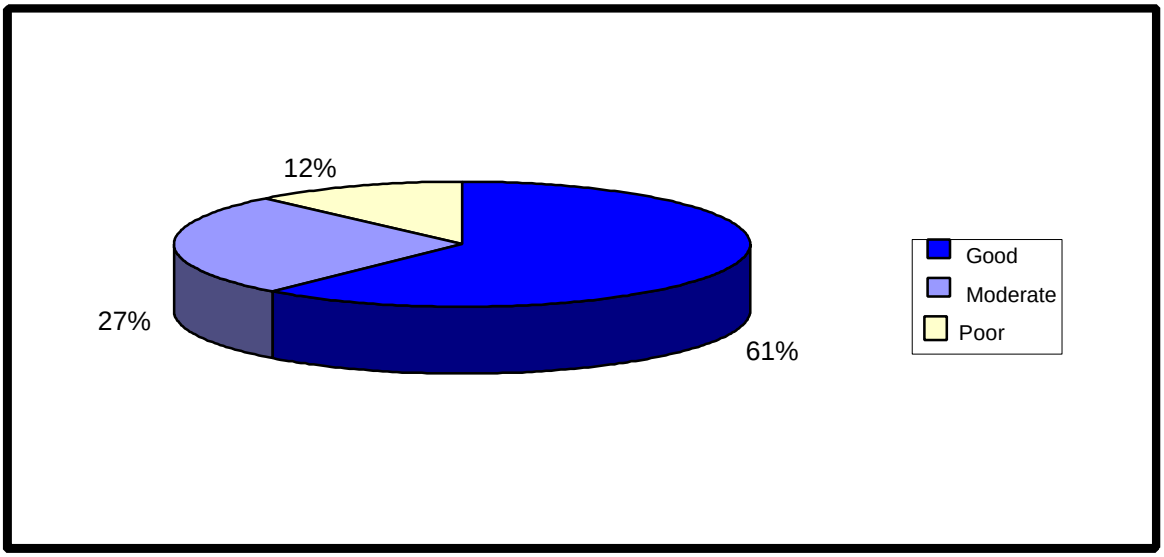


Figure 5-7 Quality of Fishery at the Regular Site: Salmon & Trout (Question 10)

As it can be noted in Figure 5-6 and Figure 5-7, a majority of respondents perceive the quality of fishing at their regular site to be good (68% of coarse anglers and 61% of game anglers stated so) or moderate (27% of both coarse and game anglers stated so) and just 12% of coarse and 5% of game anglers believe it to be poor.

This question is important for the later evaluation analysis, since individuals were asked in the WTP question to state their bid in order to preserve the *status quo* at the usual fishing site. If their perception of the fish population at this site is positive, it is likely that they would gain from the maintenance of its current status and therefore we would expect the number of individuals with a low or zero consumer's surplus to be small. This hypothesis is tested in the analysis of the WTP values.

Respondents were then asked how they perceived the water quality at their regular fishing site (Question 11). Various options were offered, with appropriate descriptions given. Results are reported in Figure 5-8 and Figure 5-9.

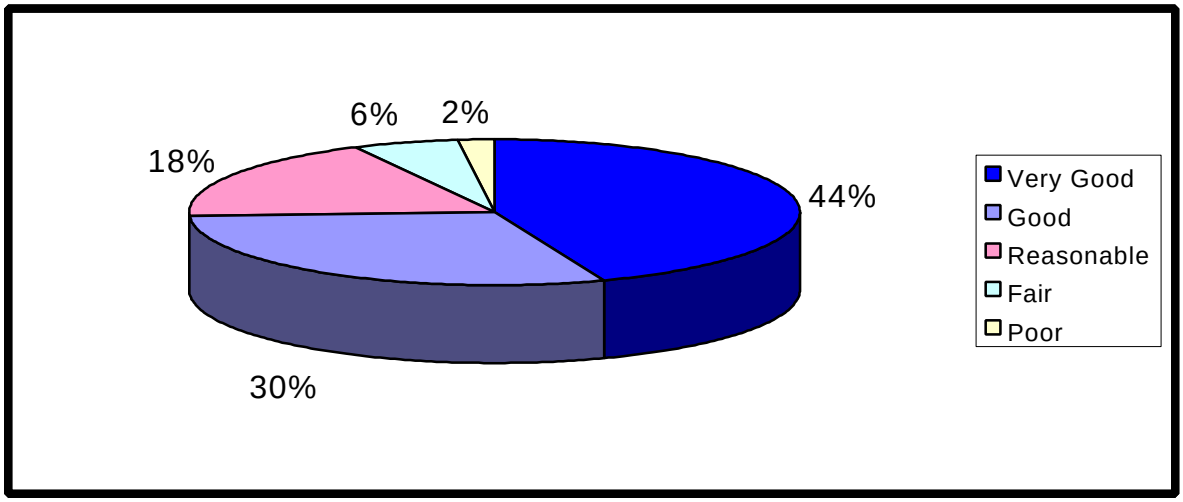


Figure 5-8 Perceived Water Quality at the Regular Site: Coarse (Question 11)

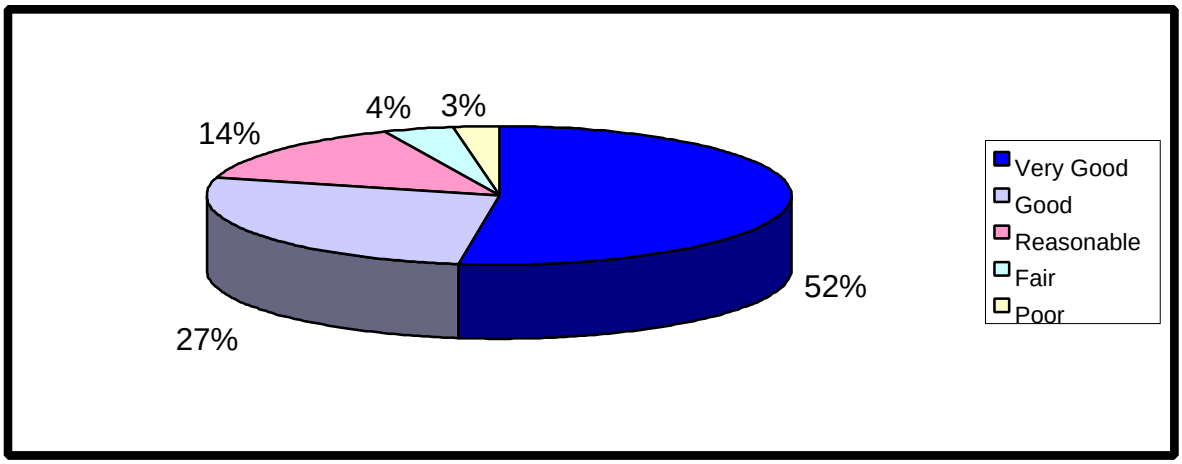


Figure 5-9 Water Quality at the Regular Site: Salmon & Trout (Question 11)

Data in Figure 5-8 and Figure 5-9 shows that respondents generally feel that the water quality to be "good" or "very good". Indeed, 74% of the coarse anglers believed that water quality was "very good" or "good" and 22% perceived it to be "reasonable" or "fair". This leaves just 2% of coarse anglers that believed the water quality to be "poor". In comparison, 79% of the game anglers perceived water quality to be "very good" or "good", 14% believed the water quality to be "reasonable", and only 3% thought the water quality to be "poor".

Question 12a asked interviewees ***how far is this site from where you live?*** The responses are reported in Table 5-9.

Table 5-9 Distance of Home from the Regular Angling Site (Question 12a)

Distance from	Coarse		Salmon & Trout	
regular site (miles)	Respondents	Percentage	Respondents	Percentage
<1 mile	88	14%	14	8%
1 to 5	187	29%	31	19%
6 to 20	215	34%	71	44%
21 to 50	115	18%	35	22%
51 to 100	26	4%	8	5%
101 to 200	6	1%	4	2%
>200 miles	2	0%	1	0%
Don't Know	0	0%	0	0%

Figures in Table 5-9 represent the aggregate values for all regions. Overall the distribution of respondents within the distance ranges lends itself to the conclusion that the most common fishing sites are fairly near to the where the respondents live. Indeed, within both sub-samples, 63% of the respondents live within 1 to 20 miles from the fishing site. However, as might be expected, a higher percentage of coarse anglers than game anglers live within a distance smaller than a mile from the site.

Question 12b asked ***"are there any other angling sites within the same distance of your home as your regular site that could provide you with a similar level of enjoyment?".*** The responses are in Figure 5-10 and Figure 5-11.

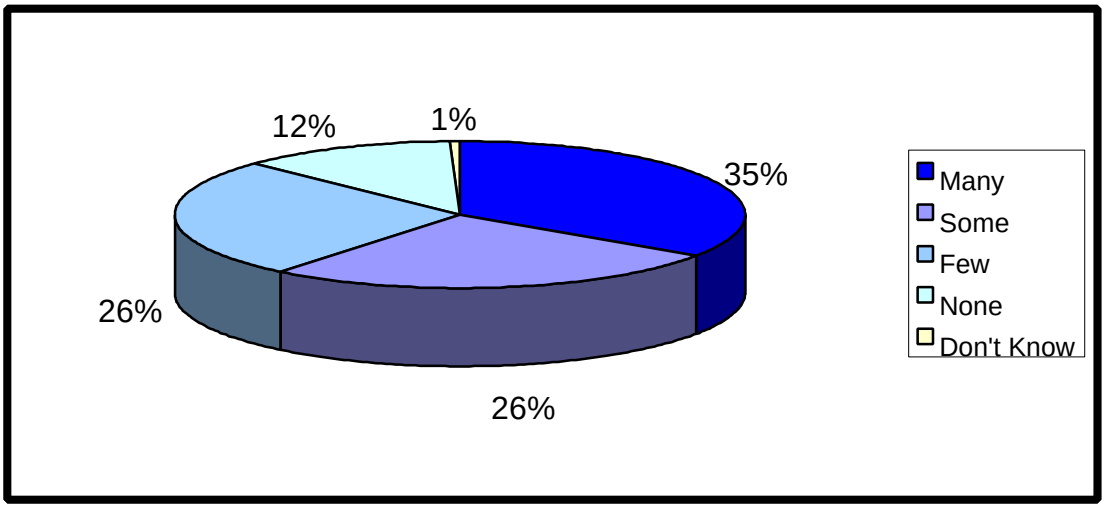


Figure 5-10 Substitute Sites to the Regular Angling Site: Coarse (Question 12b)

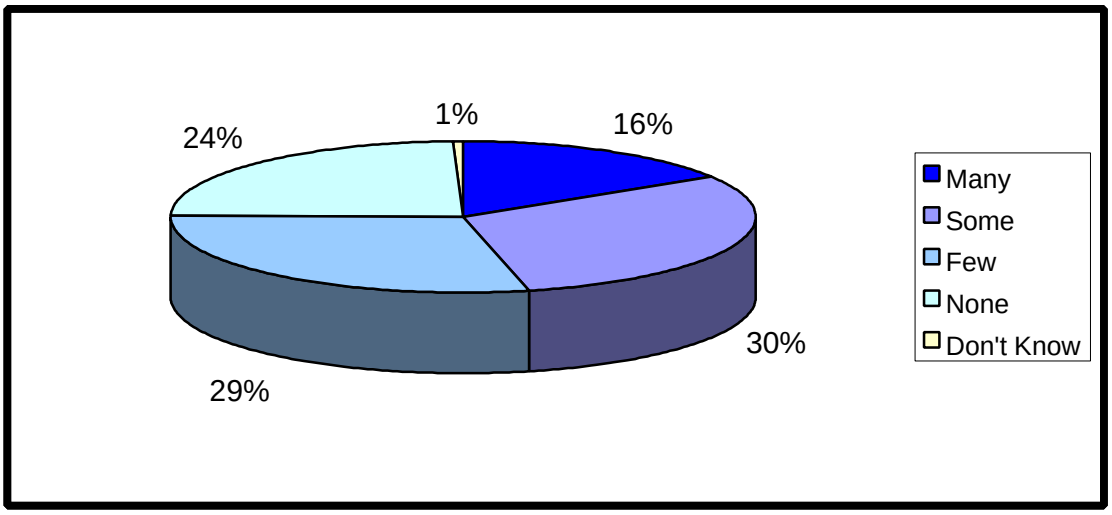


Figure 5-11 Substitute Sites to the Regular Angling Site: Game (Question 12b)

The data in Figure 5-10 shows that 87% of the coarse anglers perceived that there are at least a few substitutes within the same distance as their regular fishing site, whilst Figure 5-11 shows a figure of 74% for game anglers. The question is particularly useful for reminding anglers that there may be other sites available, hence influencing them to give a more realistic willingness to pay value in the later payment question. The same data is presented on regional basis in Table 5-10 and Table 5-11.

Table 5-10 Availability of Substitute Sites for Coarse Anglers (Question 12b)

Substitute	North West	Anglian	North East	SW/Wales	Southern/ Thames	Midlands
Many	37%	43%	42%	26%	27%	37%
Some	26%	24%	21%	27%	27%	29%
Few	23%	18%	27%	32%	33%	24%
None	14%	14%	9%	14%	13%	10%
Don't Know	0%	1%	1%	1%	0%	0%

Table 5-11 Availability of Substitute Sites for Game Anglers (Question 12b)

Substitute	North West	Anglian	North East	SW/Wales	Southern/ Thames	Midlands
Many	18%	10%	0%	13%	10%	22%
Some	29%	50%	23%	31%	35%	26%
Few	32%	20%	33%	38%	15%	22%
None	21%	20%	44%	18%	40%	26%
Don't Know	0%	0%	0%	0%	0%	4%

The regional data for coarse anglers is consistent with the aggregate figures. Indeed, over 80% of coarse anglers for each region believed that at least a few substitute sites were available. The game regional data shows greater differences across the regions. For example, within South West/Wales, Anglian and the North West regions, around 80% of anglers stated that there were at least a few substitutes to their usual fishing site, whereas within the Midlands 70% of these anglers stated so, within Southern/Thames 60%, and within the Anglian 55%.

Question 13 asked ***"What percentage or proportion of all your annual angling trips are at this site?"*** The responses are reported in Table 5-12 and Table 5-13.

Table 5-12 Percentage of Trips to the Regular Site: Coarse (Question 13)

Percentage of trips	Total	North West	Anglian	North East	SW/Wales	Southern/ Thames	Midlands
1-9 (%)	5%	6%	8%	4%	9%	2%	3%
10-24 (%)	3%	0%	3%	7%	3%	5%	2%
25-49(%)	12%	16%	2%	12%	14%	13%	13%
50-74(%)	38%	41%	42%	37%	30%	38%	40%
75-99 (%)	36%	31%	38%	35%	39%	38%	34%
100(%)	6%	5%	7%	5%	5%	5%	8%
Don't Know	0%	1%	0%	0%	0%	0%	0%

Table 5-13 Percentage of trips to the Regular Site: Game (Question 13)

Percentage of trips	Total	North West	Anglian	North East	SW/Wales	Southern/ Thames	Midlands
1-9 (%)	6%	7%	8%	0%	5%	11%	5%
10-24 (%)	2%	2%	17%	0%	2%	0%	0%
25-49(%)	9%	15%	17%	0%	2%	11%	14%
50-74(%)	35%	38%	25%	22%	34%	32%	36%
75-99 (%)	42%	35%	17%	78%	50%	42%	41%
100(%)	6%	4%	17%	0%	7%	5%	5%
Don't Know	0%	0%	0%	0%	0%	0%	0%

The results show that on both a regional and national basis over the half of the fishing activities take place at the regular site. Indeed, at national level, 74% of the coarse anglers stated that between 50% and 99% of the times they fish at their regular fishing site and 77% of game anglers stated that they do so likewise.

Question 14 asked how much, respondents spent on permits, food, accommodation and travel per trip to their regular site. The responses are summarised in Table 5-14 and Table 5-15.

Table 5-14 Expenditure per Trip to Regular Site for Coarse Anglers (Question 14)

Expenditure	Permit	Food	Accommodation	Travel
0	44%	63%	96%	22%
£5.00	46%	35%	1%	72%
£18	5%	2%	1%	5%
£38	1%	0%	1%	1%
£75	0%	0%	0%	0%
£150	0%	0%	0%	0%
£350	0%	0%	0%	0%
500	0%	0%	0%	0%
Don't' Know	5%	0%	0%	0%
Average (£) per trip	5	3	2	7

Table 5-15 Expenditure per Trip to Regular Site for Game Anglers (Question 14)

Expenditure	Permit	Food	Accommodation	Travel
0	34%	70%	91%	15%
£5.00	21%	26%	1%	70%
£18	30%	4%	3%	11%
£38	5%	0%	4%	4%
£75	1%	0%	1%	1%
£150	1%	0%	0%	0%
£350	0%	0%	0%	0%
500	0%	0%	0%	0%
Don't' Know	7%	0%	0%	0%
Average(£) per trip	12	3	3	9

The figures in Table 5-14 and Table 5-15 show that respondents on average spend around £17 per trip for coarse fishing and £27 per fishing trip for game fishing.

Question 15 investigated the level of consumer surplus (in terms of value for money) gained by the respondents from fishing in the usual site. The wording used was ***"bearing in mind your annual and daily fishing costs relating to the site, how much value for money do you think you get from fishing there?"*** The results are represented in Figure 5-12 and Figure 5-13.

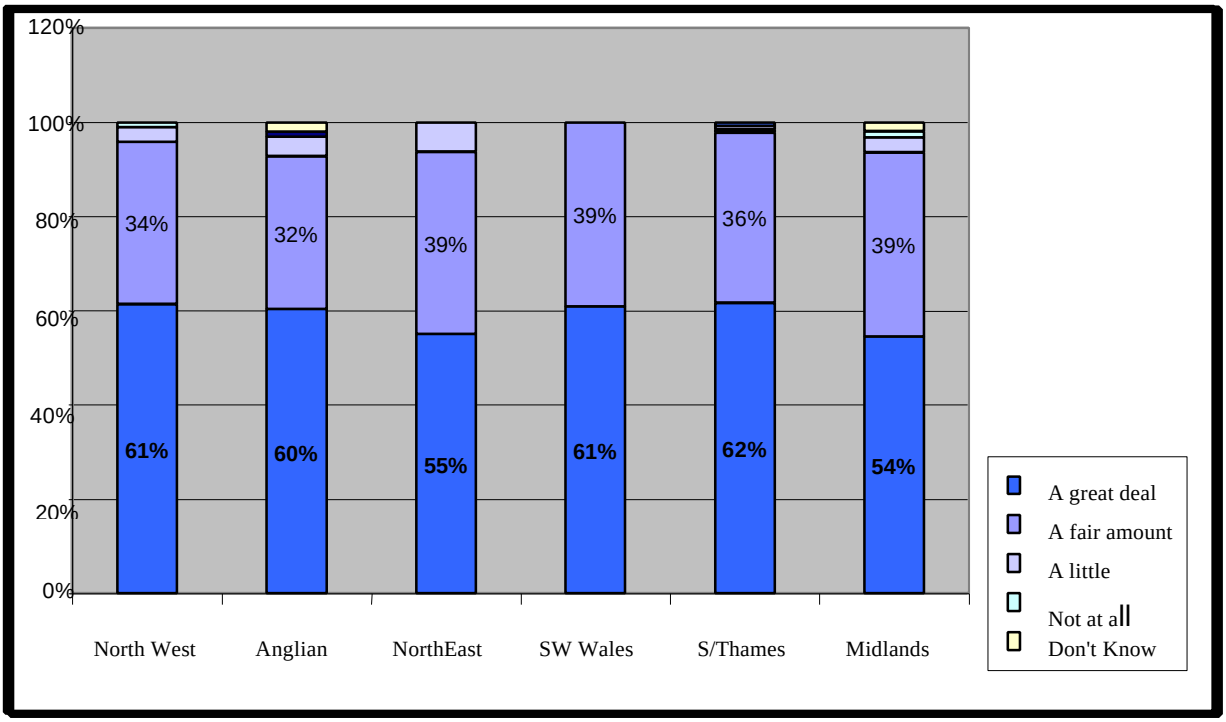


Figure 5-12 Value for Money from Fishing at the Regular Site: Coarse (Question 15)

Figure 5-13 Value for Money from Fishing at the Regular Site: Game (Question 15)

In Figure 5-12 and Figure 5-13 each region is represented separately on the x-axis, while on the y-axis the percentage of respondents who claimed to gain a "great deal", "a fair amount", "a little", "none at all" are reported. It is clear that almost all respondents believe to gain plenty of enjoyment from fishing in the regular site. Indeed, the majority of interviewees felt that they gained either "a great deal" (59% of coarse anglers and 58% of game anglers) or "a fair amount" (37% of coarse anglers and 36% of game anglers) of "value for money".

5.3 Valuation of Consumer's Surplus

Question 16 asks respondents ***"In order to guarantee that the existing quality of the fishing at your regular site was maintained in its current state, in terms of fish numbers, diversity, and size, would you be willing to pay any additional money, however small or large, to a fund specifically set up to do this?".*** The later stated willingness to pay amounts are taken to be a proxy for angler consumers' surplus.

This question can be defined as the "payment principle" question (Bateman et. al. 1995). It helps to ease respondents into the willingness to pay question, and enable the respondent to pull out of the evaluation section if she or he does not intend to pay, before being asked the WTP question. The question also helps respondents focus on the site's features strictly related to characteristics of fish size, number and diversity within their regular water body.

The question attempts to make the respondents focus on their consumer's surplus. The question asks interviewees to consider whether they are willing to pay **an additional amount of money**, (i.e. on top of costs that they have already incurred) for fishing at the regular site, to preserve this site in its current state. In other words, respondents bid the sum above the current price of fishing that they believe they would be willing to pay to preserve the fishing site and the utility gained from fishing in it.

The willingness to pay valuation question is split in two parts. The first part (Question 17a) is an open-ended question, which asks **"What would be the maximum sum of money you would be willing to pay each trip to guarantee maintaining existing quality of the fishing at the regular site, in terms of fish numbers, diversity, and size".** It is worth stressing that

this part of the evaluation question reminded the respondents of the good that was to be evaluated, thus helping to focus on maintaining the existing fish population at the site.

The second part (Question 17b) was asked only to those individuals who could not answer the open-ended question. This question asked the respondents to state whether they would be willing to pay specific sums of money. The interviewer reiterates the question for different amounts of money hence, the highest amount that the respondent is willing to pay is considered his or her maximum willingness to pay.

It was only necessary to ask the follow on question (Question 17b) to 12 respondents. Their bids have been taken into account in the evaluation of average values.

Table 5-16 presents the response to Question 19 that asked respondents ***"why did you say no to question 16"***. The analysis of these responses is carried out in order to detect possible strategic behaviour by respondents. Strategic behaviour is a misstatement of one's preferences in order to influence the survey results towards a preferred outcome.

Table 5-16 Reasons Given for Refusing to Bid (Question 19)

Reasons	Coarse	Salmon & Trout	Strategic bid
It is not an important issue	17%	18%	No
Cannot afford to pay	8%	8%	No
There are more important things	2%	4%	No
The Government/Environment Agency should pay	10%	6%	Yes
Depends on how much	0%	0%	Yes
Concern over money destiny	8%	2%	Yes
Rather give money to other charities	0%	0%	No
Pay too much already	55%	62%	No

Within the coarse sub-sample (637 anglers) 186 respondents refused to bid any money and within the game sub-sample (164 anglers) 55 respondents refused. These respondents' answers to Question 15, which reported the level of enjoyment gained from fishing at their regular site, were considered. Those individuals who had stated that they gain *a great deal* and *a fair amount* of value for money from fishing and then refused to bid were considered as potential strategic actors. Overall, 172 (within the coarse sub-sample) and 46 (within the game sub-sample) individuals were scrutinised as potentially strategic respondents.

Hence, Question 19 helped to detect true zero bidders and strategic bidders. In cases where potential strategic interviewees had answered that they were not willing to pay because *the government/Environment Agency should pay,* or *depends on how much,* or they had *concern over the money would actually be spent,* their general attitude and socio-economic characteristics were considered. In cases where this information did not support their refusals, their responses were omitted (i.e. they were strategic bidders). Where the information supported a refusal, (i.e. non-strategic bid) their bids were included as zero. Overall, 32 respondents were treated as adopting strategic behaviour within the coarse sub-sample and 4 within the game sub-sample.

A further analysis was carried out to identify possible outliers (see Section 5.4). The highest bids were selected and the socio-economic characteristics and beliefs of the respondents were examined. Only one respondent was taken out from the coarse sub-sample.

The coarse sub-sample considered in the WTP evaluation analysis comprised 605 respondents and the game analysis was comprised of 160 interviewees. Table 5-17 shows the results to the WTP questions. The data are presented on a regional basis and sub-divided for water bodies within the coarse sub-sample.

Table 5-17 Summary of Willingness to Pay Data for Coarse Anglers (Question 17a and 17b)

Agency Region	No. Respond.	% Willing to Pay	[1]Ave expend per trip (£)	Ave annual expend. (£)	Overall [2]CS WTP per trip	CS WTP River	No.	CS WTP Canal	No.	CS WTP Lake	No.
North West	94	60%	23	1,133	£2.6	£3.0	13	£1.8	10	£3.1	71
Anglian	90	85%	14	609	£3.2	£3.4	32	£2.8	4	£3.0	54
North East	74	74%	18	972	£2.3	£2.6	27	£2.8	10	£2.0	37
SW/Wales	64	71%	14	599	£3.1	£3.6	16	£4.2	4	£1.7	44
S/Thames	132	76%	21	901	£3.4	£3.8	33	£2.6	7	£2.1	92
Midlands	151	72%	15	861	£2.4	£2.5	48	£2.9	15	£2.3	88
Total Ave	605	71%	17	859	£2.8	£3.1	169	£2.7	50	£2.4	386

Notes:
1Figures for annual and per trip expenditure are estimated using the overall sample (639)
[2]CS = Consumer Surplus

It is worth noting that the majority of respondents (71%) expressed a willingness to pay an extra amount of money to maintain the fishing quality of their regular fishing site. This attitude is fairly equally shown across the six regions. This data is consistent with the positive attitude and value for money shown in previous responses by the respondents for their regular fishing site.

Coarse anglers' average regional WTP values per trip are distributed within a range between £2.3 and £3.4. These average values are also evenly distributed across the mean value £2.8; indeed, three regions have a lower WTP than the average value (North West, North East and Midlands) and three regions have a higher (Southern/Thames, South West/Wales and Anglian). Respondents in the Southern/Thames have the highest average WTP value.

Results for each water body are reported for coarse anglers across the six regions. It is worth stressing that since the various sub-samples are composed of a few respondents, the reliability of average WTP values for these is low. Sample size and therefore reliability is enhanced if the water body sub-samples for the all regions are considered. The total WTP values referring to the waterbodies in Table 5-17 show that coarse anglers are very keen on preserving the rivers *status quo*, and they are on average willing to pay more for canals than for lakes. The last statement requires a further explanation. Indeed, it is to be borne in mind that the WTP question elicited the additional amount of money per trip that individuals are willing to pay for the conservation of their usual fishing site. It is likely that individuals already spend more to go fishing to lakes than they do to go to canals, thus their total WTP for going to fish to lakes is higher but their consumer's surplus is lower. Total WTP is given by the consumer's surplus (the average CS WTP value in this study) and the average expenditure per trip.

Table 5-18 Total WTP for Coarse Fishery (Question 17a and 17b)

Water Body	Average Expenditure per Trip (inc permits)	Ave expenditure on permits per trip	Average CS WTP per trip	Total WTP per trip	CS as proportion of average total trip expenditure	CS as proportion of average permit expenditure
River	£18	£4	£3.1	£21.1	17%	78%
Canal	£13	£4	£2.7	£15.7	21%	68%
Lake	£17	£4	£2.4	£19.4	14%	60%

Total WTP figures for coarse fishing for each water body is reported in Table 5-18. The results show that the highest average consumers' surplus per trip is gained from fishing in rivers and that the overall combined consumer surplus WTP, and daily expenditure is highest for rivers. However, the greatest ratio of consumers' surplus per trip as a proportion of average expenditure is for canal fishing.

Game angler sub-samples are not sub-divided by region according to different water bodies because this would produce sample sizes that result in completely unreliable average WTP values.

Table 5-19 Summary of Willingness to Pay Data for Game Angling (Question 17a and 17b)

Agency Region	Respondents	Percentage of respondents willing to pay	[1]Ave expenditure per trip	Average annual expenditure	Consumer surplus WTP per trip
North West	54	67%	£25	£562	£3.2
Anglian	10	62%	£34	£868	£1.5
North East	9	55%	£17	£457	£3.6
SW/Wales	44	72%	£23	£830	£3.6
S/Thames	20	77%	£31	£659	£3.8
Midlands	23	75%	£33	£711	£5.0
Total Ave	160	65%	£27	£682	£3.6

Note: Figures for annual and per trip expenditure are estimated using the overall sample (165)

As previously noted for the coarse fish anglers, the majority of game anglers (65%) are willing to pay an amount of money each trip in order to preserve the current fishing status of their fishing site.

The data in Table 5-19 shows that there is a high variance of bid values across the six regions. This variance is likely to be due to the sample sizes within these regions making these results fairly unreliable. Only the overall average WTP value of £3.60 per trip should be used, as in the model in Section 7.2.

The fact that individuals are willing to spend more to go game fishing can be noted from the average per trip expenditure and consumer surplus WTP figures reported in Table 5-17 and Table 5-19 (£27 for game sub-sample compared to £17 for the coarse anglers).

Table 5-20 Combined WTP for Game Anglers (Question 17a and 17b)

Water Body	Total average expenditure per trip (inc permits)	Expenditure on Permits	Average CS WTP per trip	Total WTP	CS as proportion of average total trip expenditure	CS as proportion of average permit expenditure
River	£26	£13	£4.3	£30.30	17%	33%
Lake	£27	£11	£3.1	£30.10	11%	28%

Table 5-20 reports average WTP and average expenditure for the two waterbody types where game fishing take place. Data are consistent with the conclusion on WTP within the two anglers sub-samples. Indeed, it is evident that total WTP for fishing game in a river or a lake is much higher than that for coarse fishing in the same water bodies (respectively £27 and £26 for game compared to £18 and £17 for coarse fishery).

A further analysis of the WTP values has been carried out using figures elicited for the two sub-samples characterised by a different perception of the existing site fishery quality. These sub-samples are obtained using the answers given by respondents to question 10. As already illustrated in Section 5.2, this question investigated the perceived quality of a respondent's usual fishing site. The two subsets are composed of interviewees that answered either that this site was characterised by good condition or by those who stated that the fishery condition were either moderate or poor. Results are reported in Table 5-21.

Table 5-21 WTP for Different Fishery Quality (Question 17a and 17b)

Quality	Coarse Respondents	Coarse CS WTP	Game Respondents	Game CS WTP
Good	413	£3.0	98	£3.8
Moderate/Poor	190	£2.5	58	£3.3
Don't Know	2	£0.0	4	£0.6

The results show that individuals who fish at sites with good quality fisheries have a higher consumer surplus (willingness to pay more to preserve the condition of the site). This result is consistent with theoretical expectations. Indeed, individuals who perceive their site as good are likely to gain more enjoyment from fishing in it.

5.4 The Validity and Reliability Analysis

Analysis of the payment principle question is carried out in order to interpret refusals to bid. It is also a further tool to give insights into the motivations that underlie individuals' willingness to pay.

5.4.1 Payment Principle Analysis

The analysis of the "yes" or "no" answers to the payment principle question (question 16) is based on a probit transformation as the following:

$$\text{Prob}(y_j \neq 0 \mid x_j) = (X_i \frac{b}{s})$$

This model analyses what factors (or variables) affect the probability of "yes" responses to the payment principle question for coarse anglers. The y represents an answer to the payment

principle question that is zero when the answer is negative and conversely is different from zero if the answer is positive. x is a vector of the explanatory variables. Based on the above theoretical framework, the best model to explain the responses to the payment principle question is elicited for the coarse and trout and salmon sub-samples.

$$\text{Prob}(y_j \neq 0 \mid x_j) = \underset{(6.5)}{1.3} + \underset{(-3.25)}{0.14}\,Variety + \underset{(1.09)}{0.04}\,Income - \underset{(-4.7)}{0.23}\,Age \qquad (1)$$

The above model is derived given σ being normalised to 1. The values in brackets are z values, which are determined to test the significance of the coefficients. Z values are used in conjunction with t-statistics to test non-linear restrictions. They are "normally" distributed and thus use the normal distribution critical values. However, this study assesses the robustness of the overall model focusing on the Likelihood Ratio (LR) test. The sign and significance of the coefficients are analysed below, whilst the values of the coefficients are not interpreted further.

The robustness of this model was tested using the LR test. The LR tested the null hypothesis that the slope coefficients (for the four variables) were equal to zero and therefore the variables do not affect responses. Since the LR test is a χ^2 distribution, this test uses χ^2 critical values to assess the significance. In this case, where there were four restrictions to be tested, the critical value was 7.81 and the above model LR was 33.44. These results suggest that equation (1) is relatively robust.

Equation 1 thus indicates that the probability each respondent agreed to pay an extra amount of money to maintain their fishery at its current status in the future is dependent on the following four variable:

- the age of the respondents
- their income
- "fish variety" being important factors when fishing.

The negative sign of the *age* coefficient indicates a negative correlation between the age of the respondent and their likelihood of being willing to pay. This result is consistent with theoretical expectations. Indeed, the older the respondent is, the lower is their concern about the future, and maintaining the quality of their fishing site. This may, however, mean that adopting "maintenance of the existing quality of their fishing site" may not truly reflect consumer surplus. The respondents' income influence positively their willingness to pay, this result is consistent with theoretical expectations.

The *variety* variable expresses the importance of the variety of fish species in the water for people to go fishing. This indicates that individuals who expressed species diversity as a reason to go fishing are more likely to be willing to pay to preserve their usual fishing site.

The same theoretical framework was used for the analysis of the salmon & trout anglers' responses to the payment principle question. The best model is as follows:

$$\text{Prob}(y_j \neq 0 \mid x_j) = 0.22 + \underset{(1.71)}{0.025}\,Food + \underset{(2.75)}{0.23}\,Sizefish + \underset{(2.11)}{0.22}\,Class \qquad (2)$$

Again values in brackets are z values. In this model, the LR tested three restrictions. The fact that the model has a critical value of 7.8 and an LR equal to 16.12 suggests that the model is reasonably robust.

The probability that game anglers responded positively to the payment principle question is influenced by expenditure on food per trip. Interestingly, the sign of the variable *food* reveals that the higher the expenditure on food the more likely respondents are to bid. This could however, simply relate to some form of strategic bias, in that such respondents indicating a willingness to pay are also more likely to suggest that they spend money on food. Thereby ensuring higher values are attached to fishing as a result of this study.

Sizefish indicates that anglers who claimed that the size of fish caught was an important reason for fishing are more likely to bid an amount of money. This is likely to be true.

The *Class* variable indicates that respondents from higher social classes are more likely to be willing to pay than individuals from lower social classes. This result is consistent with theoretical expectations.

5.4.2 General Statistics

It is useful to provide general statistics for the evaluated average WTP for the two sub-samples, coarse and game anglers.

The following table reports average WTP values for the two sub-samples, standard deviation, variance and confidence intervals for these estimates.

Table 5-22 Relevant Statistics for Average WTP Values

Anglers	Average WTP	Standard deviation	Median	Variance	95%confidence interval	
Coarse	£2.8	4.1	1	16.83	2.5	3.1
Salmon&Trout	£3.6	5.03	1	25.38	3.2	4.77

The above statistics provide a useful picture of the variability of the answers. It is worth noting that the coarse sub-sample is characterised by a large standard deviation if compared with the mean value. The variance is also high, indicating some unreliability of the results produced by random answers. The following analysis focuses on the reliability of this CV study, as well as on its validity.

5.4.3 Regression Analysis

The Contingent Valuation study validity that is considered here is “theoretical validity” as part of “construct validity” (Mitchell and Carson, 1989). Theoretical validity tests the consistency between the results of a CV study and theoretical expectations. In order to carry out such a test, a bid function needs to be determined. The bid function is a model that explains the variation in WTP values depending on the variation of attitudes and socio-economic characteristics of respondents.

The regression helps also in assessing the reliability of this study. Results are reliable when they are reproducible and stable over time. “Most narrowly defined, reliability refers to the extent to which the variance of the WTP amounts given by respondents in a contingent

valuation survey is due to random sources, or 'noise'"(Mitchell and Carson 1989). Indeed, the variance of responses reflects the true variance of WTP within the population and variations due to a random variance introduced by the questionnaire design.

A way to detect this variance is to retest the questionnaire in a later point in time. Alternatively, in order to show that responses are not random ones an explanatory model (in this case an Ordinary Least Squares (OLS) model), characterised by an adjusted R^2 greater than 15%, has to be achieved. This requires that WTP variations are linked to attitudes and respondents' characteristics, and therefore are not due to some particular questionnaire feature biasing the responses towards random bids.

The model used here to explain the bids is a linear multivariate regression where the WTP is the dependent variable, this model outperformed a logarithm form which used the same independent variables. Equation 3 is the model that best explains the variation of bids for coarse anglers:

$$WTP = \underset{(8.7)}{4.69} - \underset{(2.77)}{0.37}\ Age + \underset{(2.42)}{0.003}\ annexp + \underset{(1.37)}{0.19}\ Waterq + \underset{(1.95)}{0.05}\ Permits + \underset{(10.75)}{0.04}\ Valufor \qquad (3)$$

Where:
WTP = Willingness To Pay
Age: age of the respondent
Annuexp: average annual expenditure on fishing
Waterq: perceived water quality at the fishing site
Permits: Average expenditure on permits per trip
Valuefor: Value for Money

Figures in brackets are t –values. Where t>2.58 it means the significance of the estimate is within the 99% confidence interval, when t is between 2.58 and 1.96 it is within the 95% confidence interval, when between 1.96 and 1.64, it is within the 90% confidence interval, and when lower than 1.64 entails a significance of less than 90%.

Because of the type of codes used in the questionnaire, the meaning of some coefficient signs requires an accurate explanation.

Waterq indicates how respondents perceive the water quality at their fishing site. The sign of the coefficient reveals a positive correlation between high water quality at the fishing site and the WTP value. This result is consistent with theoretical expectations.

Age variable indicates that the older the respondents were, the lower the level of their bids was. This result is consistent with theoretical expectations because of the smaller concern about future availability of the good held by the older respondents.

Permits and *Annexp* show the influence on the WTP values of expenditure on permits per trip and average annual expenditure. The sign of these two variables shows a positive correlation between these expenditures and the amount bid by the respondent. This data shows that coarse anglers who pay a high amount of money are likely to bid more on maintaining the site they fish in.

Valuefor variable assesses how important gaining *value for money* is in determining the WTP values.

The latter relationship represents the major strength of equation 3. Indeed, *Valuefor* shows that the WTP values are perceived as representative of the value for money that individual are getting from fishing at the site. In other words, this variable shows that the amount of money coarse anglers are bidding is the monetary equivalent of the enjoyment they are getting from fishing and for which they are not paying (i.e. consumer's surplus). The t value of *Valuefor* shows a high explanatory value of this variable, strengthening the hypothesis that WTP values elicited in this CV study are a good approximation of the consumer's surplus of coarse anglers. .

As far as the explanatory value of the model in equation 3 is concerned, the t values indicate that overall these variables have a relevant influence in determining WTP responses. The explanatory value of the overall model is proven by an adjusted R^2 equal to 18.7% so despite the high variance of responses which generally characterises social surveys, this model explains reasonably enough the variations of WTP values. It has to be stressed that 18.7% is only just above the 15% threshold, adopted in CV literature as the minimum to assess the reliability of the study.

Therefore the adjusted R^2 value in the model used in this analysis supports the instrument reliability, which means that the questionnaire has been structured in an informative, credible and understandable way.

A different matter is to test the reliability of sample. This has to be assessed in terms of sample representativeness of the population (see 5.5) and size.

The best model for the game sub-sample is as follows:

$$WTP = \underset{(4.99)}{5.02} + \underset{(1.07)}{0.35}\,Class + \underset{(2.79)}{0.03}\,Tripex - \underset{(1.46)}{0.02}\,Permits + \underset{(6.47)}{0.04}\,Valuefor \qquad (4)$$

Where:
WTP: Willingness To Pay
Class: Social Class
Tripex: Expenditure per trip
Permits: Annual average expenditure per trip
Valuefor: Value for Money

The *Class* variable shows how the social class affects the WTP values. The sign of this variable shows a positive correlation between the bids and the social class. Thus, respondents from a higher social class bid a higher amount of money to preserve the regular fishing site at the current state. This result is consistent with theoretical expectations. Indeed, a higher social class is likely to involve a higher income and therefore a reduced budget constraint, thus more money available to bid. Therefore, the social class variable helps in eliciting the influence of income on WTP bids. It should be noted that the income variable itself was not considered in either of the two regression models because its statistical significance was too low.

Tripex assess the influence of the average expenditure per trip on the WTP values. The sign of this variable shows a positive correlation between the amount of money paid per trip (trip expenditure) and the amount bid by the respondents. This result is analogous to the one noted for the coarse angler regression model.

Permits indicates how much respondents spend on fishing permits per year. The sign of the variable reveals a negative correlation between the amount of money spent on permits per year and the willingness to pay value. This is perhaps expected.

The *Valuefor* analysis is also analogous to the one provided for the coarse sub-sample, and again this supports the hypothesis that this CV study has succeeded in eliciting the consumer's surplus of anglers.

As far as the statistical meaningfulness of the variables used in model 4 is concerned, the t values (reported in brackets) show that these variables have a relevant influence in determining WTP responses. As far as the instrument reliability of model 4 is concerned the adjusted R^2 is equal to 28%. This is well above the minimum threshold of 15% indicating that this CV study has achieved reliable results.

As far as sample size is concerned, this report uses the assessment table suggested in Mitchell and Carson (Mitchell and Carson 1989, p 225). This table reports approximate sample size figures "for different combinations of relative error (V), confidence levels (1-π), and the percentage difference between" true WTP and estimated WTP. (Mitchell and Carson 1989).

The methodology requires an estimation of V, which is given by the ratio of standard deviation and the estimate of WTP (i.e. $V=\frac{s}{EWTP}$). Hence, using the table, it is possible to establish the percentage difference (Δ) from the estimated WTP that can be used to evaluate ranges within which the 90% or 95% of the true WTP values lie. Table 5-23 presents the results of the sample size analysis:

Table 5-23 Sample Size Analysis

Anglers	Respondents	V	α	Δ
Coarse	605	1.5	0.10	10%
Game	160	1.5	0.10	20%

The results in Table 5-22 show that given the coarse sub-sample size (605 respondents), the estimated WTP value is likely to be within 10% of the true value for 90% of the time. The game sample size suggests that the estimated WTP is within 20% of its true value for 90% of the time.

A further analysis of the WTP responses is carried out to detect possible outliers which might affect the reliability of the average WTP value. This analysis uses trimmed average WTP values for both sub-samples. The trimmed WTP values are obtained by ordering WTP bids and then truncating the 5% and 10% highest values. The results are presented in Table 5-23.

The changes in WTP values suggest that higher bids do affect the average values. Therefore, a further analysis of highest bids was carried out. This analysis focused on beliefs, attitudes and socio-economic characteristics of the highest bidders and, as already reported in Section 5.3, resulted in one respondent from the coarse sub-sample exclusion from the consumer's surplus evaluation.

Table 5-24 Trimmed WTP Values

Anglers	Average WTP	5% Trimmed WTP	10% Trimmed WTP
Coarse	£2.83	£2.1	£1.7
Salmon&Trout	£3.56	£2.7	£2.2

5.5 Socio-economic Characteristics Analysis

Analysis of the socio-economic features of respondents is important to assess how representative the sample is with respect to the whole angling population. The approach used is to compare the respondents' features with those in the NRA 1994 study sample, which had a sample size of 1,543 anglers.

This study sample is composed of 806 respondents of whom 94% (774) are male and 4% (32) are female. The socio-economic review of anglers 1994 stated that 88% of respondents were male and 12% were female. The two results are reasonably close.

Consistently with the NRA 1994 study, this analysis considers the respondents' social class. The results are reported in Table 5-25.

Table 5-25 Comparison of Social Class (Question Class)

Social Class	This study - 2000	[1]Agency 1994 adjusted	Agency 1994 data
A – Professional, management, executive staff	19%	19%	9%
B – Clerical, administrative	24%	24%	11.6%
C – Skilled manual worker	37%	35%	16.8%
D – Unskilled manual worker	19%	21%	10%

[1]The 1994 NRA data was adjusted for this study as detailed below.

The data in 1994 was gathered during the first random screening of 6,546 households within England and Wales. It refers to the percentage of households classified in the different social classes, which had at least one angler (a total of 47.4% of households). The 1994 data thus needs to be adjusted to be comparable with this study. This was carried out by simply multiplying the 1994 values by 100/47.4, to convert them to the equivalent base number of 100%. The adjusted data shows a remarkable consistency.

A comparison of respondents' age for the two study samples is shown in Table 5.26. The results are difficult to compare, but indicate that the respondents' distribution in this study is somewhat skewed towards older individuals. Indeed 65% of the interviewees are over 40 years old. This may be due to the fact that telephone interviews can pick up more retired people. In part, the results may also be influenced by the fact that this study only interviewed individuals over 16. However, the data is also consistent with the conclusion on the respondents' age reported in the 1994 national anglers' survey that revealed a general increase in the anglers' age.

Table 5-26 Age Characteristics of Anglers Interviewed

1999 Study Age	1999 Study Respondents (%)	1994 Study Age	1994 Study Respondents (%)
16-29	16%	12 to 14	12%
30-39	18%	15 to 20	18%
40-49	25%	21 to 34	28%
50+	40%	34 to 54	29%
		Over 55	13%

A comparison of interviewees' income for the different types of fishery and the different regions is a useful exercise, as shown in Table 5-27. It allows an assessment of the representativeness of the samples and may in part explain slight differences between average WTP values for different regions. There is always a danger with questions on income that the answers are biased. In this case it shows that the incomes for game are only slightly above those for coarse. In addition it clearly shows a much higher income for the Southern/Thames, as may be expected.

Table 5-27 Average Income of Respondents

Agency Region	Average Income Coarse	Respondents	Average Income Game	Respondents
North West	£22,000	75	£25,000	43
Anglian	£25,000	74	£25,000	6
North East	£23,000	64	£25,000	6
SW/Wales	£25,000	54	£22,000	40
S/Thames	£31,000	106	£36,000	14
Midlands	£23,000	130	£29,000	19
Total	£26,000	503	£28,000	128

6 GENERAL PUBLIC SURVEY

6.1 General Attitudes

The general attitudinal questions were designed to gather information on the public's general beliefs regarding environmental issues and in particular specific attitudes towards the relative importance of fish in rivers, lakes and canals. In addition, the questions play an important role in making respondents realise that there are many other general and environmental issues that they may want to see improved, and hence may also have a willingness to pay for.

Question 1 (see Appendix B for full questionnaire) investigated the degree of the respondents' concerns for environmental issues compared to other major social issues (such as health, crime, unemployment etc.). The comparative importance of each issue was assessed by asking the respondents to express whether *more or less money should be spent by the country as a whole on maintaining or improving* that issue within England and Wales. The results are reported in Table 6-1.

Table 6-1 Preferences for Public Expenditure on Various Social Issues[1] (Question 1)

Social Issues	Much more	Somewhat More	No more or Less	Somewhat Less	Much Less	Don't Know
Health	79%	17%	3%	0%	0%	1%
Unemployment	62%	28%	8%	0%	1%	1%
Crime						
Education	59%	30%	8%	0%	0%	2%
Public Transport	51%	32%	12%	2%	1%	2%
Environment	34%	42%	20%	1%	1%	2%
Historic Buildings	9%	28%	46%	10%	5%	3%

Note: Based on full sample of 843.

As can be seen from Table 6-1, the environment was not the respondent's most important concern. If the percentage of interviewees who stated *much more* and *somewhat more* public expenditure should be spent on each issue is considered, environment ranks fifth, with historic buildings ranking last (sixth).

However, in absolute terms, the concern of the sample for the environment was actually quite high, since 76% of them feel that more public money should be spent on maintaining or improving the environment. In terms of accuracy of the questionnaire responses, the results for this question are encouraging in that respondents seemed to be answering honestly, and have not overstated their environmental preferences.

The second question asked the respondents ***"In your opinion, how important is the general quality of the environment for each of the following in England and Wales?"*** Table 6-2 shows the results for the various ecosystems and environmental sites listed.

Table 6-2 Importance of Environmental Sites (Question 2)

Site	Very Important	Fairly Important	Neither Important Nor Unimportant	Fairly Unimportant	Very Unimportant	Don't Know
Woodland/ Forest	54%	38%	5%	1%	0%	1%
Canals	29%	50%	13%	5%	0%	2%
Beaches/ Sea	61%	32%	5%	1%	0%	1%
Nationally Important Wildlife	50%	42%	6%	1%	0%	1%
Rivers	55%	38%	5%	1%	0%	1%
Local Parks	49%	43%	5%	1%	0%	1%
Lakes	42%	47%	8%	2%	0%	1%

Note: Based on full sample of 843

The figures in Table 6-2 show that among inland water body environments, rivers were considered to be the most important. Indeed, overall 93% of the respondents thought rivers to *be very* or *fairly important*, whereas 89% of the respondents believed so of lakes, and just a 77% claimed canals to be *very* or *fairly important*. Moreover, if only *very important* responses are considered, the gap between rivers, lakes, and canals is widened. In this respect, rivers are *very important* for 55% of respondents, lakes for 42% and canals for only 29%.

The greater importance can be readily visualised in a graphical representation of the responses (see Figure 6-1). It is also worth noting that overall, beaches/sea is considered the most important environment of the choices given to respondents, and canals the least important.

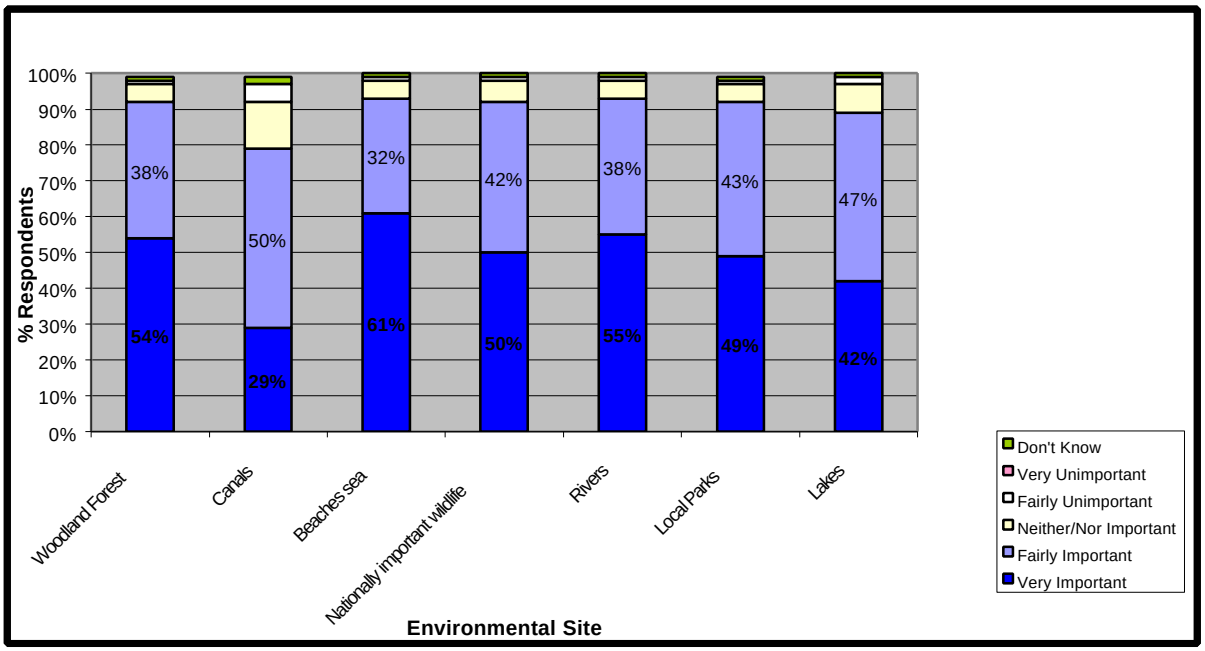


Figure 6-1 Importance of Different Environmental Sites (Question 2)

In question 3 respondents were asked "***How important do you think it is to maintain and improve the following feature of rivers, lakes and canals?*** A summary of the results for the various features offered to them is shown in Figure 6-2.

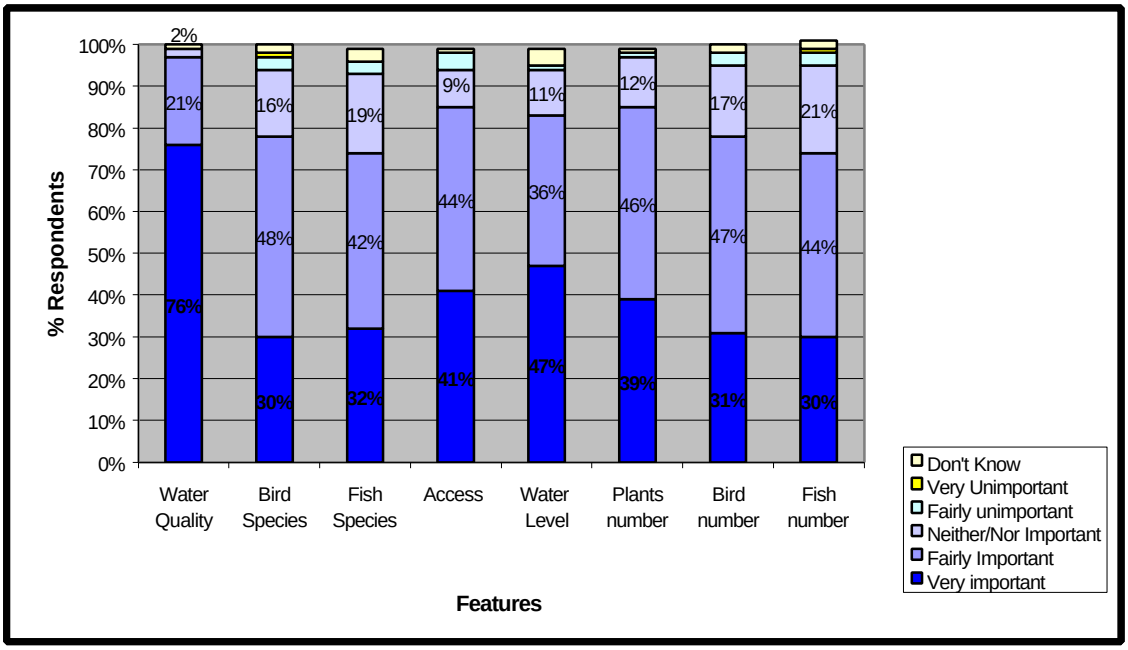


Figure 6-2 Importance of Water Related Environmental Features (Question 3)

The results clearly show greatest concern over water quality, which was stated to be *very important* by 76% of the sample. Water levels were second most important followed by access (41%). The fact that access is less important than water quality and water levels indicative of a degree of non-use value.

The abundance and variety of fish were said to be *fairly important* or *very important* by 74% of respondents. This is an important statistic in terms of indicating the overall benefit to the public of maintaining fish abundance and diversity. However, one point worth noting is the negligible difference in value to respondents of the variety of species (for both fish and birds) compared to the abundance of species. This might suggest that individuals do not distinguish diversity from abundance of fish and birds.

Table 6-3 Importance of Water Related Environment Features (Question 3)

Features	Very Important	Fairly Important	Neither Important/ Nor Unimportant	Fairly Unimportant	Very Unimportant	Don't Know
Water Quality	76%	21%	2%	0%	0%	1%
Bird Species Variety	30%	48%	16%	3%	1%	2%
Fish Species Variety	32%	42%	19%	3%	0%	3%
Access	41%	44%	9%	4%	0%	1%
Water Level	47%	36%	11%	1%	0%	4%
Plants number	39%	46%	12%	1%	0%	1%
Bird Abundance	31%	47%	17%	3%	0%	2%
Fish Abundance	30%	44%	21%	3%	1%	2%

Note: Based on full sample of 843.

The last question of the Section 1 of the questionnaire (Question 4) examines the type and frequency of recreational use that interviewees make of waterbodies. A summary of the responses is reported in Table 6-4 and presented in Figure 6-3.

Table 6-4 Frequency of Undertaking Water Related Activities (Question 4)

Activity	Often	Sometimes	Rarely	Never	Don't know
Walk, jog, cycle	35%	33%	15%	17%	0%
Picnic, sunbathe	20%	38%	22%	21%	0%
Enjoy wildlife	36%	36%	15%	12%	1%
Go fishing	5%	6%	9%	79%	1%
Fish watching	15%	30%	24%	31%	0%
In-Stream activities (e.g. boating, canoeing)	4%	9%	16%	71%	1%

Note Based on full sample of 843 respondents.

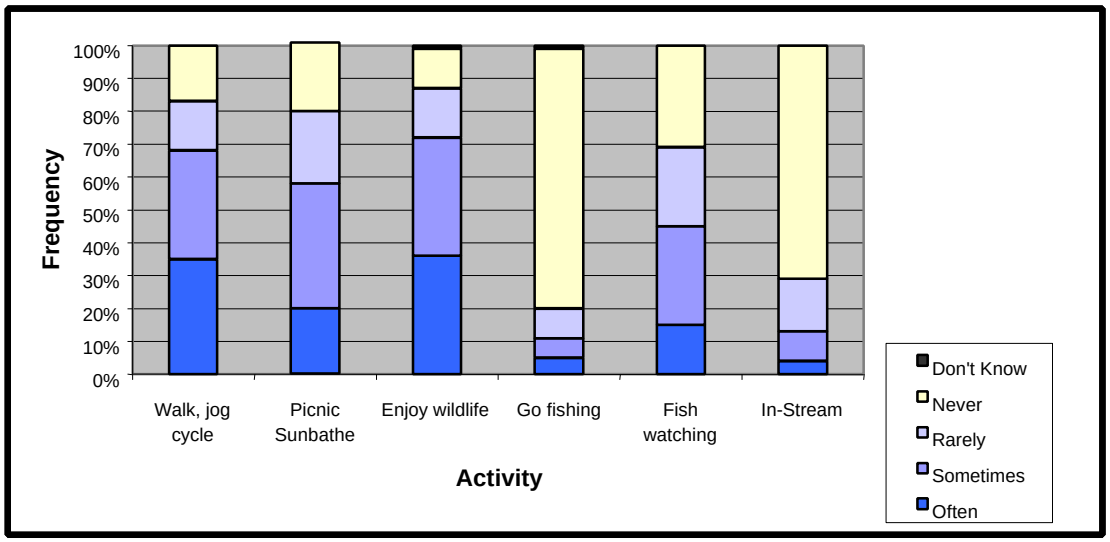


Figure 6-3 Frequency of Undertaking Water Related Activities (Question 4)

The respondents appear mainly to enjoy bank-side activities such as walking, cycling, picnicking, enjoying the wildlife (undertaken by around 80% of the population), whilst angling and in-stream activities (boating, canoeing) are undertaken by only around 10% of people. It is interesting to note that enjoying wildlife is the most common activity (72% do so *sometimes* or *often*). In addition, almost half of all people (45%) either *sometimes* or *often* look at or see fish. Almost 70% (69%) claim to watch/see fish at least occasionally.

6.2 Scenario 1- Value of Fish in Nearest Waterbody

Scenario 1 was used to evaluate the respondents' willingness to pay (WTP) values to improve the number and size of the fish population at the nearest waterbody to the respondent.

Respondents unable to refer to their nearest water body (10%) were instead asked either to think of the water body they visited the most, or another known water body. For the purpose of this study, these respondents are effectively deleted from the sample and assumed to have zero WTP for the WTP analysis. This is because the WTP (Section 6.3 and 6.4) specifically relate to the nearest water body to respondents. In reality the 10% of respondents here are likely to have some value for improving fish populations at their nearest waterbody. Consequently, the resulting WTP will be slightly conservative.

Table 6-5 and Table 6-6 report the type of water body respondents referred to (i.e. nearest, most visited or just a known water body) and whether the nearest water body was a river, a lake or a canal.

Table 6-5 Knowledge of Water Body (Question 5)

Reference Water Body	Respondent Number	Percentage
Nearest Water Body	763	90%
Most visited Water body	14	2%
Other Known Water Body	24	4%
Cannot recall any Water Body	42	4%
Total	843	100%

Note: Based on full sample

Table 6-6 Type of Nearest Water Body (Question 6a)

Type of Water Body	Respondents	Percentage
Stream/River	405	48%
Lake (Reservoir)	235	28%
Canal	115	14%
Don't Know/Not Stated	8	1%
Unable to recall	80	9%
Total	843	100%

Note: Based on full sample

As Table 6-6 shows the great majority (90%) of the sample could refer to the nearest water body. Only 24 respondents referred to a generally known water body (e.g. the Thames).

In the analysis of the WTP answers, the respondents referring to their nearest waterbody were split into three sub-samples according to the type of water body they referred to. The numbers in Table 6-6 thus indicate how interviewees are distributed across those sub-samples.

Question 6b asked respondents to state ***"roughly how many other rivers, lakes and canals do you know reasonably well that are within 15 miles or so from the site?"***. The main purpose of this question was to get people to think about possible substitute sites. Responses to this question are shown in Figure 6-4.

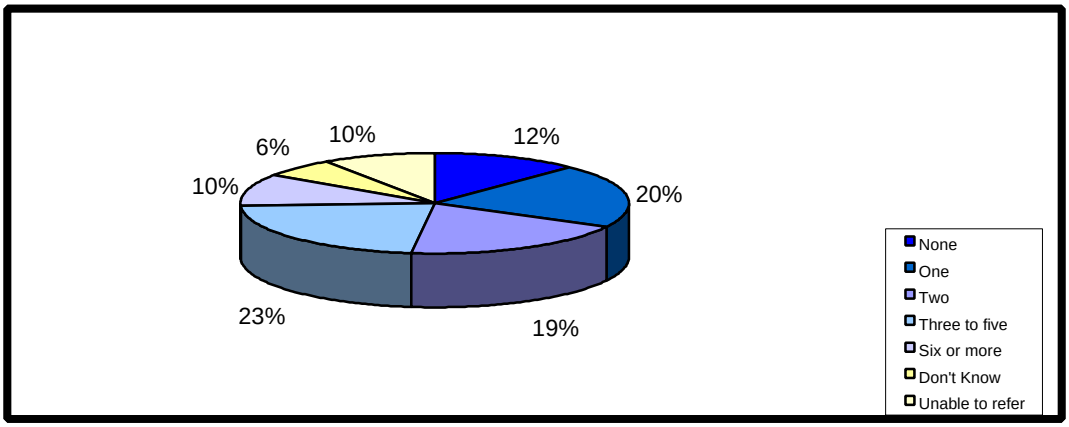


Figure 6-4 Number of Substitute Sites to Nearest Waterbody (Question 6b)

Around 70% of respondents stated that there was at least one substitute site within fifteen miles from the site they referred to. The perception that substitute goods were available should have helped respondents to state a more realistic WTP bid (see later). Indeed, responses were thus more likely to be related to the particular improvement suggested in the scenario, reducing the likelihood of embedding effects.

Question 8 asked respondents how far away they lived from the site. Responses are reported in Table 6-7. The distribution of the respondents' distances from the reference site was mainly concentrated within 20 miles (84%), as can be noted in Table 6-7. The most common distance (mode) was within 1 to 5 miles (34%).

Table 6-7 Proximity of Site from Home (Question 8)

Distance	Respondents	Percentage
Overlooking it	39	5%
Within 1/4 mile	88	10%
1/4 mile to 1	138	16%
1 to 5 miles	285	34%
6 to 20 miles	168	20%
21 to 50 miles	29	3%
51 to 100 miles	9	1%
Over 100 miles	2	0%
Don't Know	5	1%
Unable to refer	80	9%

Note: Based on full sample of 843 respondents

Question 9 asked respondents ***"On average, how many times a year do you visit the site?"***. The data (see Table 6-8) shows that respondents were fairly evenly distributed in terms of their frequency of visits. Only 9% of respondents never visited the site. The average number of visits per person per year to their nearest waterbody is 20 (calculated to be 19.5).

Table 6-8 Frequency of Visits (Question 9)

Times per Year	Number of Respondents	Percentage
More than 100 day/year	83	10%
About 50 day/year	75	9%
About 25 day/year	73	9%
About 12 day/year	104	12%
About 6 day/year	89	11%
About 3-4 day/year	99	12%
Once or Twice a year	146	17%
Never	77	9%
Don't Know	17	2%
Unable to refer	80	9%

Note: Based on full sample of 843 respondents

Question 10 asked interviewees what activities they undertook at the site they were referring to. Results are presented in Table 6-9. The information in this table is formatted in the same way as Table 4, though in this case interviewees were required to focus exclusively on their reference site. It is interesting to note that the figures are consistent with respect to those in Table 6-4. Over half (52%) claim to at least occasionally look at or watch fish at the site.

Table 6-9 Activities Undertaken at the Nearest Site (Question 10)

Activities	Always	Usually	Occasionally	Never	Don't Know	Unable to refer
Walk, Jog, Cycle	32%	16%	24%	17%	0%	9%
Picnic, Sun Bathe	10%	13%	33%	34%	0%	9%
Enjoy Wildlife	26%	18%	29%	17%	1%	9%
Go fishing	3%	2%	6%	79%	0%	9%
Fish Watching	11%	12%	29%	39%	0%	9%
In-Stream activities (i.e. boating, canoeing)	2%	1%	7%	79%	1%	9%

Note: Based on full sample of 843 respondents

Question 11 asked the respondents what their perception was of water quality at their nearest site. Figure 6-5 highlights the results.

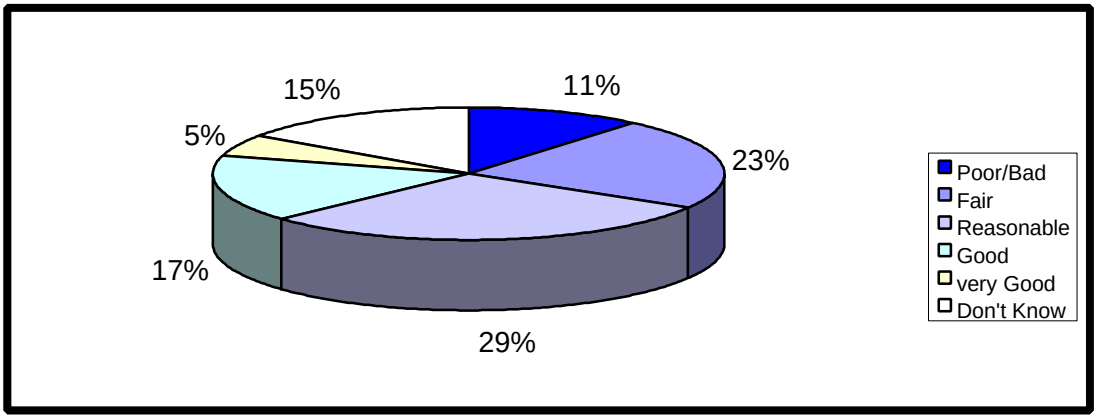


Figure 6-5 Perceived Water Quality at the Reference Site (Question 11)

The following two questions (Questions 12 and 13) focused on respondents' perception of fish population at the reference site.

Question 12 asked respondents to state whether certain statements relating to fish populations at their site were true or false. Table 6-10 reports this list of statements and the proportion of respondents claiming the statements to be true. The main purpose of this question was to get the respondents to think about the likely presence of fish at their site (priming them for Question 14). Only 21% had never thought about fish at the site.

Table 6-10 Statements Regarding Fish that Apply to the Nearest Site (Question 12)

Statement	True (number of respondents)	True (percentage of respondents)
Never seen a fish	192	23%
Seen fish in the water	424	50%
Sometimes seen few anglers	352	42%
Sometimes seen many anglers	169	20%
Never thought about fish	179	21%
Stocked with fish	218	26%
Seen dead fish	68	8%
None of these	41	5%

NoteThose unable to refer to the nearest site are assumed to have never seen a fish at their nearest site

Question 13 asked respondents ***"Can you name any types of fish that you know or think live at the site?"*** The summary of the results is reported in Table 6-11. They suggest that respondents had a reasonable knowledge of the fish population at their reference site. For example, 42% of respondents could name a type of fish living at the site.

Table 6-11 Familiarity With Fish (Question 13)

Extent of familiarity	Number of Respondents	Percentage
Named a fish	356	42%
Don't Know if there are any fish	84	10%
Don't Know the name of the fish	298	35%
Other[1]	105	12%

Note 1: Respondents who could not refer to the nearest site are included in "Other" response

Question 14 asked interviewees ***"In your opinion, which of the following do you think best describes the fish population living in the water there?"*** (i.e. at their preferred site). The respondent was presented with a card (Show Card 10) which described various levels of fish populations. Results are presented in Table 6-12.

Table 6-12 Fish Population at the Site (Question 14)

Description	Number Respondents	Percentage
None	55	7%
Poor	109	13%
Reasonable	229	27%
Good	84	10%
Some fish, no estimate	162	19%
Don't know	124	15%
Unable to refer to the nearest site	80	9%

Note: Based on full sample of 843 respondents

Respondents were then asked one of four questions (Questions 15a, 15b, 15c or 15d). These asked ***"do you think you personally would benefit in any way if actions were taken to permanently increase the amount of fish in the waterbody from none to poor (15a), poor to reasonable (15b), reasonable to good (15c), or maintain a good fish population (15d)"***. It is worth noting that all of these questions specified that the improvement would be achieved through actions that "*might include improving the habitat for fish to live and breed in, and putting in more fish, although assume that the water quality would not change"*. The actual scenario used depended on their view of the state of the existing fish population in Question 14. Results are presented in Table 6-13.

Table 6-13 Benefits for Improvements in Fish Population (Question 15a,b,c,d)

Improvement in fish population	Respondents	Respondents %	No benefit %	Benefit %	Don't Know/ Depends
None to Poor	54	6%	59%	31%	10%
Poor to Reasonable	232	28%	70%	22%	8%
Reasonable to Good	392	47%	62%	30%	8%
Maintaining Good	84	10%	51%	45%	4%
Unable to Refer to nearest site	80	9%	100%	0%	0%

Note: Based on full sample of 843 respondents

For those people that said they would benefit from an improvement or by maintaining a good fish population, they were then asked in Question 16 how much they personally would benefit in terms of increased satisfaction or enjoyment. In total 34% of those respondents referring to their nearest water body said they would benefit (Table 6-13). Table 6-14 shows that 85% of these respondents went on to say that they would benefit either *"a little, a fair amount* or *a lot"*.

Table 6-14 Extent of Improved Utility (Question 16)

Grade	Number of Respondents	Percentage
Not at all	24	8%
A Little	78	27%
A Fair Amount	100	34%
A lot	70	24%
Depends	12	4%
Don't Know	10	3%

Note: Only based on those who claim to benefit

Those people that would benefit were then asked in question 17 ***"In what way, or ways, do you think you personally would benefit?".*** Figure 6-6 shows the percentage of respondents who mentioned different reasons for benefiting from improvements in fish population. This question was open-ended, with no prompting. Descriptive responses given were matched with a list of possible pre-agreed reasons. It shows that the main motives for them benefiting, relate to improved wildlife, existence values of the fish, seeing more fish, their children and relatives benefiting, and bequest values. A few respondents (4%) mentioned links to water quality. They were reminded that improved fish stocks would not relate to improved water quality.

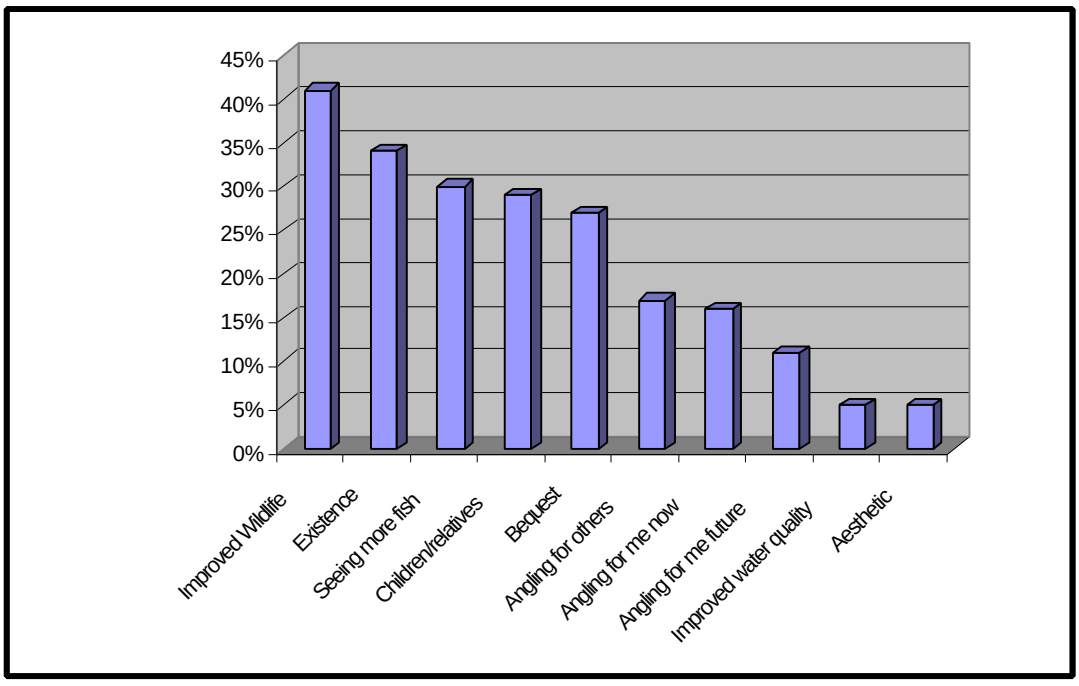


Figure 6-6 Benefit Motivations (Question 17)

Question 18 asked respondents ***"I would like you to think again about how you might benefit. Please think carefully and say in which of the following ways, if any, you personally might benefit from such actions through your own increased satisfaction or enjoyment."*** Then interviewees were shown a card (Show Card 12*)*, which listed various ways of benefiting. An index for the degree of the benefit was elicited, as shown in Table 6-15.

Table 6-15 Degree of Benefit (Question 18)

Motivation	Grade of benefit
Wildlife improved	2.86
Children/young relatives	2.63
Able to see more fish	2.26
Existence of more fish	2.25
Angling improved for others	2.00
Option to go fishing	1.51
Angling improved for oneself	1.37

Note: Based on 801 respondents who could recall a waterbody

The grade of benefit reported in Table 6-15 is an average score that ranges between 1 and 4. A score of 4 means that a particular effect (e.g. existence of more fish) results in "a lot" of enjoyment for the respondent, while a score of 3 represents "a fair amount", 2 represents "a little" and 1 represents no utility accruing from that effect.

The information reported in Figure 6-6 and Table 6-15 show that benefits accruing to households from an increase in fish population are related to both use and non-use values. The main motivations being "knowing that the wildlife has improved there"; and "knowing that your children/young relatives might benefit"; "just knowing that there are more fish there"; and "seeing more fish".

Most of these values actually have an element of use value within them. This is particularly true given the claims noted in Table 6-4 and

Table 6-9 that many of the respondents use their water bodies for watching wildlife and watching fish.

6.3 Willingness to Pay for Scenario 1

Question 19a asked respondents "To ensure that the actions did go ahead to improve or maintain the fish populations in the water body you are talking about, would you be willing to contribute any money, no matter how little or how much?". This question is the "payment principle question" and allowed respondents who were not willing to pay to pull out before being introduced to the WTP question.

In total, 507 interviewees (55% of the whole sample) are considered to have zero bids. Included in this total are the 42 respondents unable to recall any waterbody and the 38 respondents who referred to either the most often visited water body or a general water body within England and Wales, This approach ensures a more conservative overall result. A further 42 respondents who declared that they were willing to pay, then stated a zero WTP value. These responses are within the 507.

All those who referred to their nearest waterbody and said they would not be willing to pay (385 respondents) were asked why in Question 20. This enabled strategic responses to be

identified. For example, an analysis was carried out to determine the consistency of responses for those interviewees claiming to benefit from fish population improvements, but who stated that they were not prepared to pay for such improvement. For this sub-sample, their motives for refusing to pay were investigated.

Table 6.16 indicates which motives were considered to be strategic responses. If respondents had mentioned any of these motives, their responses were further scrutinised. Indeed, their environmental attitudes and socio-economic characteristics were then considered. Where there were no apparent justification for the inconsistent behaviour of these respondents, then they were deleted from the sample as protest bidders. Following this methodology, 30 respondents were pulled out of the WTP analysis.

Table 6-16 Motives for Refusing to Pay Towards Improvements (Question 20)

Motivations	Percentage	Strategic Behaviour
There are more important things	23%	No
Cannot afford to pay	23%	No
Government should pay	20%	Yes
Not important	19%	No
Prefer to give to other charities	10%	No
Prefer to pay by different method	5%	Yes
Concern over how money spent	5%	Yes
Not affected	3%	No
Complaint about Agency	3%	Yes
Pay already	2%	No
Should be funded by Local Authority	2%	Yes
Anglers should pay	1%	Yes
Depends on how much	1%	Yes
Other	10%	Yes
Don't Know	2%	No

Note: Based on those who refused to pay anything

A further analysis was carried out to search for possible outliers. This time the focus was on those respondents offering excessive bids. The reasons for bidding, socio-economic characteristics and environmental attitudes of the highest bidders were thus analysed. Only one outlier was identified and omitted.

The remaining sample thus comprised 812 respondents (i.e. a total of 843 less 30 strategic bidders and 1 outlier). Before being introduced to the evaluation question, those respondents who agreed to pay an amount were asked to choose their preferred payment vehicle from a list of possible choices (Question 19b). The reasons for offering several payment vehicles is that this minimises potentially strong payment vehicle bias if only one vehicle is offered. Figure 6-7 presents which payment vehicle respondents selected.

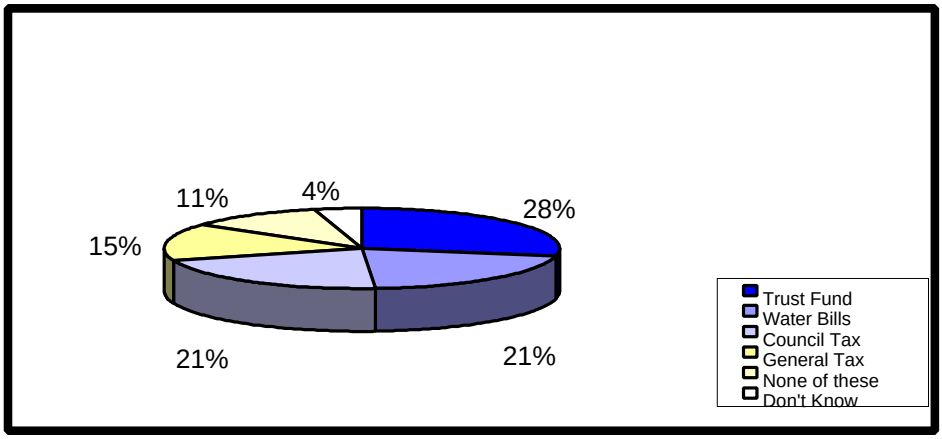


Figure 6-7 Selection of Payment Methods (Question 19b)

The majority of respondents chose a coercive payment method (general tax, council tax, and water bills). Almost one third of the bidders opted for a payment to a trust fund, and the remaining 15% either preferred a payment method not listed or did not know what to choose.

The mean WTP values were determined using the responses from the whole 812 respondent sample. Zero willingness to pay values are assumed for all respondents who refused to pay anything, those who could not think of any water body, and those who could not refer to their nearest water body. The latter two assumptions may be somewhat extreme, in that respondents unable to refer to their nearest waterbody may still have a value for the fish stocks in it. Thus it results in a more conservative average WTP values.

Question 21 (WTP question) asked respondents "Bearing in mind your financial constraints and the other things you would like to spend your money on, which of the amounts on the card would be the MAXIMUM amount of money you would be willing to pay EVERY YEAR, through the preferred payment method to ensure that the scheme went ahead?"

It is worth noting that the wording of this question should help the respondents to consider their annual budget and alternative expenditures, which should influence the evaluation process, and therefore help them in bidding a more realistic amount of money. (Loomis, Caban, Gregory 1994, Bateman and Langford 1997).

WTP values by region for the overall sample are presented in Table 6-17. The WTP values in the following tables are all "average values per household per year". The Table also shows what proportion of respondents are willing to pay for improvements in fish populations. Differences in the average number of respondents willing to pay is reflected in the average WTP values.

Table 6-17 Willingness to Pay on Regional Basis (Question 21)

Agency Region	Sample size	% Respondent WTP	Average WTP (£/hse/yr)	5% truncated sample WTP (£/hse/yr)	10% truncated sample WTP (£/hse/yr)
Southern	81	70%	7.48	3.97	2.34
South West	78	53%	7.95	5.00	2.93
Wales	79	37%	9.04[1]	6.19[1]	4.50[1]
Thames	141	44%	7.33	5.21	3.67
Midlands	119	48%	8.93[1]	5.86[1]	4.46[1]
Anglian	83	53%	5.43	3.56	2.68
North West	117	62%	4.21	2.23	1.45
North East	114	77%	2.56	1.26	0.82
Total sample	812	54%[2]	6.49	3.73	2.40

Note[1]: These values are likely to be inflated (see Section 6.7).
Note[2]: Although 54% said they may be willing to pay something (includes it depends responses), 10% of these then gave a zero WTP value.

The national average household WTP value is £6.49. The results manifest variability in average regional WTP values. Northern regions have the lowest values (North West average value is £4.21 and North East is £2.56). Wales and the Midlands have the highest WTP values (respectively £9.04 and £8.93). However, it is worth noting that these two regional samples have a higher than expected education and average income per household respectively (see Section 6.7) that probably biased the bids towards higher values.

The 5% and 10% truncated WTP values present an analogous regional pattern to the average WTP values and again there is appreciable regional variability in the bids.

As can be seen from the truncated WTP values it is clear that high bids do affect WTP mean values. Indeed truncation of the highest 5% bidders from the sample causes an average 40% reduction in average WTP values, and a further 5% truncation results on average in a further 30% reduction of WTP values. This suggests that the average values are quite strongly influenced by a small percentage of respondents. However, as already illustrated, the highest bids were scrutinised, and this search for outliers justified pulling out only one respondent.

One means of enhancing the overall reliability of the results is to "mitigate the effect of outliers through the use of robust statistical estimators" (Mitchell and Carson 1989) such as α-trimmed WTP values. In this study the 5% truncated average annual household WTP is adopted in the model in Section 7.5. Due the nature of what is being valued, this is considered an important and necessary adjustment.

A further analysis can be carried out on overall WTP bids for four different categories of improvement in fish populations at the referenced water body. Again the 42 respondents who could not recall any water body were assumed to have zero WTP. The results of this approach are shown in Table 6-18.

Table 6-18 WTP for Alternative Levels of Fish Population Improvements (Question 21)

Improvement	Respondents	Average WTP (£/hse/yr)	WTP 5% Truncation (£/hse/yr)	WTP 10% Truncation (£/hse/yr)
None to Poor	58	£7.5	£5.2	£2.9
Poor to Reasonable	236	£4.7	£2.3	£1.7
Reasonable to Good	397	£7.5	£4.5	£3.4
Maintain Good	79	£10	£7.6	£5.4
Not able to refer	42	£0	£0	£0
Total	812	£6.49	£3.73	£2.40

The results in Table 6-19 show a high average WTP value for improving the fish populations from none to few and maintaining a good population. The high value bid for improving fish populations from none to few is consistent with theoretical expectations. Indeed, individuals are willing to pay a lot to "buy" the first unit of fish population in the reference site from which they are likely to gain a high utility. Likewise, it is understandable that maintaining a good fish population would have a relatively high utility.

A further analysis of the WTP values was carried out to assess the relationship between WTP and type of waterbody. Results are presented in Table 6-19.

Table 6-19 WTP for Different Waterbodies (Question 21)

Water Body	Respondents	Average WTP (£/hse/yr)	WTP 5% Truncation (£/hse/yr)	WTP 10% Truncation (£/hse/yr)
River	404	£7.26	£4.29	£2.37
Lake	242	£6.11	£3.54	£2.48
Canal	115	£7.29	£3.96	£2.14
Unable to refer	42	£0	£0	£0
Total	812	£6.49	£3.73	£2.40

Results show that the highest average WTP values were for improving the fish population in rivers and canals. However, it is worth noting that the canal sub-sample size makes this result less reliable compared to the values provided for rivers and lakes. The sub-samples do not consider the nine respondents who could not decide what kind of water body they were referring to.

6.4 Validity and reliability analysis for Scenario 1

6.4.1 Payment Principle Analysis

The distribution of responses within the sub-sample of respondents referring to the nearest water body shows a relatively high percentage of individuals not willing to pay (50%). This is an important issue that has to be dealt with. Indeed, "the treatment of protest responses, non-protest zeros, and generally willingness to pay in the vicinity of zero continues to cause difficulty in the estimation and interpretation of welfare measures" (Mitchell, 2000).

Protest bids were dealt with as explained in Section 6.3. The remaining "true" zeros were 397 (355 individuals who stated they were not willing to pay anything in response to the payment principle question (Q.19a) and 42 who stated they were willing to pay £ zero in answering the

willingness to pay question) to whom a further 80 zeros (individuals unable to refer to the nearest water body) were added (in reality not necessarily true zero WTP responses), 477 zero responses overall. This suggest that the sample is divided into two sub-samples. One of which is composed of zeros, individuals "out of the market", and the other of positive WTP values, individuals "in the market" (Carson 2000).

In order to analyse socio-economic characteristics and respondents' attitudes which affected their likelihood to be "in the market" or conversely "out of the market"; it is necessary to analyse responses to the payment principle questions. A probit model is adopted within the theoretical framework used in Section 5.4.1.

In the probit model the 38 individuals who could recall a water body but not the nearest and the 42 who could not recall any water body are not included. Indeed, to consider these respondents within the sub-sample of negative responses to the payment principle question seemed to be misleading. This because these individuals may or may not have preferences for an improvement of fish population at the nearest water body, although they could not recall the necessary information to express their preferences at the time of the interview, and any form of preference imputation seemed inappropriate. Effectively, this sub-group is not considered in the explanation of negative bids although they are considered (as zeros) in the evaluation of the average WTP value.

The best model to explain the responses to question 19a is as follows;

$$prob(y_j \neq 0 \mid x_j) = \underset{(-9.76)}{-1.42} + \underset{(-10.35)}{0.5}Seefish + \underset{(3.04)}{0.1}Edu \qquad (5)$$

Values in brackets are z values. Again the robustness of this model was tested using the Likelihood Ratio (LR) test, and again the null hypothesis is that the two variables have no influence in the decision undertaken by respondents as to whether or not they will pay something towards improving or maintaining fish populations at their reference site. The critical value in this case is 5.99, and the LR of equation 5 is 128.35, which shows a high level of significance of the two variables in the decision.

Seefish variable indicates the influence of benefiting from ***"knowing*** (that) ***you*** (they) ***might be able to see more fish there*** (at the reference site)**"** in the respondent's decision to pay. The sign of the variable shows that individuals who state that they would benefit from seeing more fish are more likely to state a "yes" response to Question 19a. This is interesting in that much of the benefit may actually relate to "use" value rather than "non-use" values.

Edu variable shows how education affects the responses to question 19a. The sign of this variable shows how better education enhances the probability that respondents are willing to pay.

It is worth noting that the motivations (listed in question 18) for benefiting from actions taken towards the enhancement or preservation of fish population at the nearest water body were all fairly important in explaining the probability that individuals would respond positively to the payment principle question. The *seefish* variable showed the highest explanatory value in interpreting responses to question 19a. This is why it is used in model 5.

6.4.2 General Statistics

General statistics relating to the average WTP are provided in Table 6-20. It is to be noted that the general statistics below were evaluated for the entire sample of valid responses.

Table 6-20 Relevant Statistics for average WTP values

Average WTP	Standard Deviation	Variance	Median	95% Confidence Interval
6.49	14.6	213.32	0	5.49 to 7.49

The figures in Table 6-20 suggest that high variability affects the bids stated. Indeed, standard deviation and variance have fairly high values reflecting relatively high variance in the WTP values expressed. It is useful to show, in Figure 6-8, the broad spread of values. Given the nature of what is being valued, and the general variability in people's preferences for wildlife and paying for wildlife, the degree of spread is understandable.

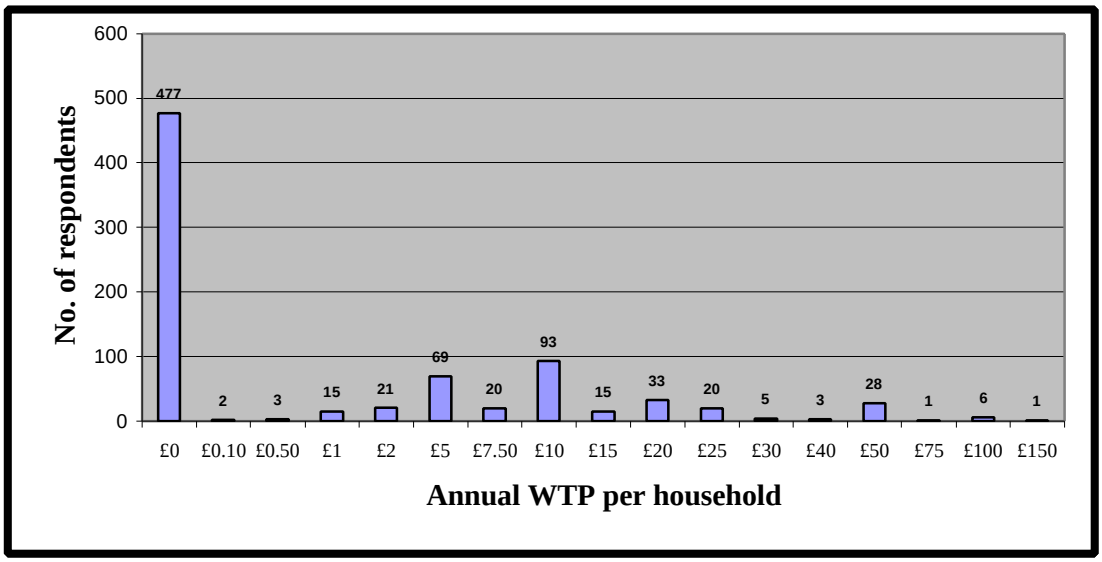


Figure 6-8 Distribution of the WTP Bids (Question 21)

6.4.3 Regression Analysis

In order to assess the reliability and theoretical validity of the results rigorously, a bid function was considered in the semi-log (the dependent variable) form. The model that best explains changes in WTP values is as follows:

$$LnWTP = \underset{(113.12)}{2.2} + \underset{(1.4)}{0.24}\,\mathrm{Pr}\,of + \underset{(3.14)}{0.43}FishStocked + \underset{(2.04)}{0.0009}Income + \underset{(3.74)}{0.25}Env \qquad (6)$$

Where:

LnWTP: Natural log of maximum WTP values
Prof: Possess of a professional qualification or higher degree
FishStocked: Site perceived to be stocked with fish
Income: Gross Household Income per Year
Env: Importance of environmental issues

The use of a semi-log model means that the above model does not consider the distribution of zero responses. In other words, it helps to focus the explanation of variation in bids of those individuals "in the market" only.

Since the above model includes income within the explanatory variables, the sub-sample of individuals who refused to state their income is not considered. This is undertaken based on the assumption that these item non-responses are a random sub-sample. A different econometric approach would be required if these item non-responses constituted a sample selection bias (Begona et. al. 1999).

The *Prof* variable indicates that individuals with a professional qualification or a higher degree are more likely to bid a higher WTP value. This result is consistent with theoretical expectation.

FishStocked shows the relationship between the perception of the fish population in the water body and the bids. Respondents who believe the site to be stocked with fish are more likely to bid higher amounts. This finding is interesting, but perhaps consistent with the results presented in Table 6-18, where the highest average WTP value was to maintain good fish populations.

Income variable shows that a higher income influences the WTP value positively. This result is consistent with theoretical expectation. Indeed, a different income implies a different budget constraint, which is likely to be less limited in the case of higher level of income. Therefore, all other factors affecting the demand for that environmental good being equal, we would expect the positive correlation between income and WTP value.

Env indicates that respondents more concerned about the environment as one of the major social issues were likely to express a higher WTP value. This result is somewhat ambivalent. Indeed, it is expected that individuals more aware of environmental issues are keener on spending more money on environmental protection or melioration, which is the case of the scenario presented in this survey. On the other hand, it may suggest that a "warm glow" effect is affecting the motivations that underlie the WTP values expressed by respondents. Indeed, individuals may be bidding not just for improvements in fish population at the nearest water body but for the environment as a whole, and gaining in this way "moral satisfaction" (J. Andreoni, 1990; Kahneman and Knetsch, 1992).

The analysis of the variable coefficients therefore shows overall consistency with theoretical expectations.

The t-test values show that two of the four variables considered are highly significant (within 99% confidence interval). Whereas, the t-value for *Income* shows significance at the 95% level and the *Prof* is significant at the 80% level. Nevertheless, these two variables were included for theoretical interest. The adjusted R^2 does not achieve the (6) is 15% threshold value mentioned in section 5.4. Indeed, the adjusted R^2 for equation 10%. This low adjusted R^2 indicates a high instrument variance and is of some concern with respect to the reliability of the results.

However, a low adjusted R^2 is "typical of OE (open ended) experiments" (Bateman et. al. 1999), thus questionnaires adopting an open-ended willingness to pay question are expected

to have low goodness of fit. This is likely to be the case given the nature of what is being valued.

6.4.4 Sample Size Analysis

In order "to obtain an acceptable degree of precision in sample statistics, such as the mean WTP amount, contingent valuation studies require large sample sizes because of large variances in the WTP responses" (Mitchell and Carson 1989, p 224). Again, the methodology and sample size table provided in Mitchell and Carson were used for the sample analysis to assess the reliability of the study sample size. The results are reported in Table 6-21.

Table 6-21 Sample Size Analysis

Respondents No.	Coefficient of variation V	Confidence limit α	Deviation Δ
812	2.5	0.10	30%

The results show that given a coefficient of variation of 2.5 for 90% of the time the estimated WTP will lie within a 30% deviation of the true WTP.

6.5 Scenario 2 - Value of Salmon in the River Wye

Scenario 2 considers the River Wye which runs through parts of the Welsh and Midlands Environment Agency Regions. It investigates if, and to what extent, the general public in England and Wales would benefit from the implementation of a scheme to improve the river habitat and thus enhance the salmon population. See the reproduced questionnaire in Appendix B for details.

Respondents were introduced to a scenario that depicts a decline of 80% in numbers of salmon caught, which is perceived to be a reasonably reliable index of the fall of the overall salmon population. The respondents were asked to contribute towards a scheme that aims to restore the salmon population to its original level through improvements to the river habitat.

The scenario started (Question 23) by asking respondents ***"Have you ever visited the River Wye?".*** Table 6-22 reports the results.

Table 6-22 Visits to the Wye (Question 23)

Agency Region	Visited the Wye		Not Visited the Wye		Don't know if visited	
	No.	%	No.	%	No.	%
Southern	25	30%	57	70%	0	0%
South West	29	35%	53	64%	1	1%
Wales	40	49%	42	51%	0	0%
Thames	50	34%	96	65%	1	1%
Midlands	56	47%	63	53%	1	1%
Anglian	17	20%	67	80%	0	0%
North West	32	26%	91	73%	2	2%
North East	19	16%	100	83%	1	1%
Total	268	32%	569	68%	6	0%

Note: Based on full sample of 843 respondents.

Table 6-22 shows data for each of the Environment Agency Regions within England and Wales. Data shows that a majority (68%) of respondents have not visited the River Wye. The

last statement is not true for the Wales and Midlands sub-samples which are divided almost evenly between visitors and non-visitors. This is not surprising given that the two regions incorporate the river catchment area.

Question 24 then asked ***"Are you likely to ever visit the River Wye in the future?"*** Results are presented in Table 6-23.

Table 6-23 Likelihood of Visiting the Wye (Question 24)

Agency Region	Definitely visit the Wye in the future	Probably/may visit the Wye in the future	Unlikely to visit the Wye in the future	Don't Know
Southern	21%	24%	46%	9%
South West	34%	30%	30%	6%
Wales	35%	30%	21%	13%
Thames	27%	31%	28%	14%
Midlands	50%	30%	13%	7%
Anglian	12%	32%	46%	10%
North West	23%	20%	42%	15%
North East	8%	18%	54%	19%
Total	11%	41%	35%	13%

Note: Based on full sample of 843 respondents

Table 6-23 considers the likelihood of future visits to the Wye. Those who stated that they "may" or will "probably" visit the Wye are grouped in the second column. Around half of the respondents stated that they may visit the site at some point in the future. Again the samples from the Welsh and Midlands Regions state a higher likelihood of future visits.

It is worth noting that three regions, namely Anglian, North West and North East have had the fewest visits, and are least likely to visit the river in the future.

Question 25 asked respondents ***"Do you think that you personally would benefit in any way, in terms of increased satisfaction or enjoyment, if the scheme were to go ahead, and salmon numbers returned to their former levels?".*** The results are shown in Table 6-24.

Table 6-24 Respondents Benefiting from Improved Wye Habitat and Salmon Populations (Question 25)

Agency Region	Likely to visit the Wye	Benefiting %	Not Benefiting %	Depends
Southern	45%	33%	59%	8%
South West	64%	35%	51%	14%
Wales	66%	41%	52%	7%
Thames	58%	28%	67%	5%
Midlands	80%	41%	44%	15%
Anglian	44%	23%	69%	8%
North West	43%	29%	68%	3%
North East	27%	11%	86%	3%
Total	52%	30%	62%	8%

Note: Based on full sample of 843 respondents

On average, although 52% said they are likely to visit the Wye, only 30% felt that they would benefit from the Wye fish population improvement scheme. The percentage of respondents benefiting clearly varies between the regions, but is linked to the proportion of people who

may visit in the future. It is worth stressing that amongst the eight regions, Anglian, North West and North East present the lower percentage of respondents perceiving themselves as beneficiaries from the River Wye fish population restoration. The last consideration is consistent with the previously noted low levels of interest indicated by these regions.

Question 27 asked respondents ***"I would now like you to think a little more about how you might benefit. Which of the following ways, if any, might you personally benefit from this scenario on the River Wye through your own increased satisfaction or enjoyment?".*** Respondents were then offered a list of various motivations. The motivations underlying the utility arising from river Wye scheme are presented in Figure 6-9.

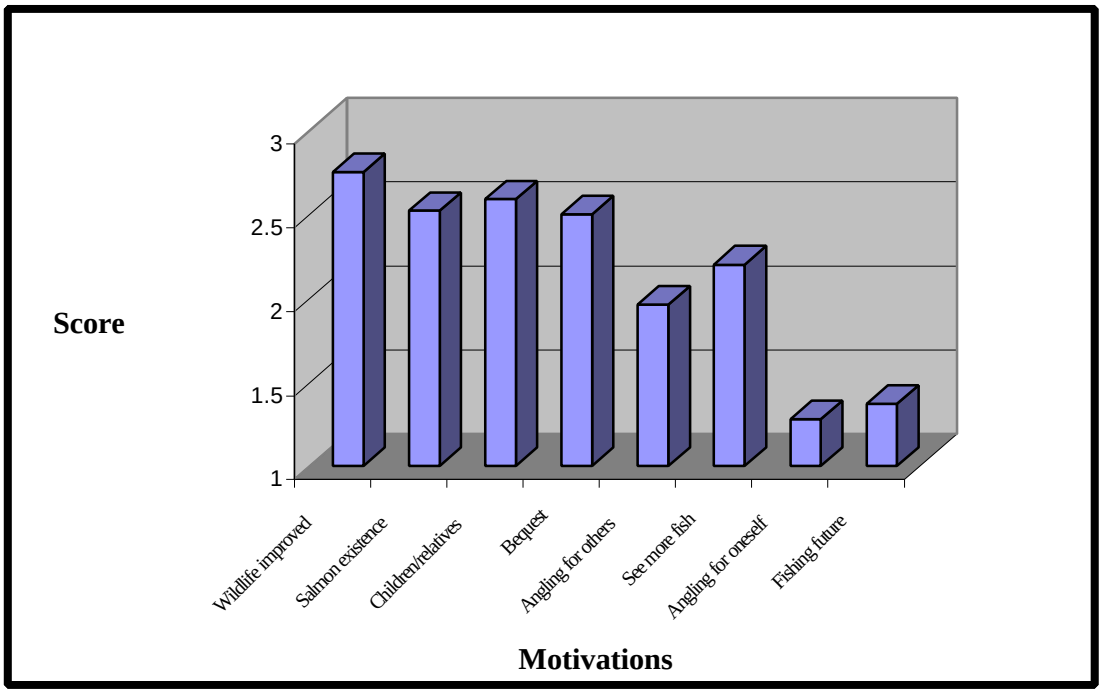


Figure 6-9 Benefit Motivations (Question 27)

Figure 6-9 uses scores that indicate the grade or intensity of utility derived from a particular aspect or effect of salmon population improvement. As previously explained, the grade of benefit is an index ranging between 1 and 3. A score of 3 means that a particular effect from increasing the salmon population results in a lot of enjoyment for the respondent, while a score of 1 means that no utility would accrue from that effect.

A brief analysis of Figure 6-9 reveals that the main benefits accruing from salmon population increases (as a result of a habitat improvement scheme) relate to improvement in wildlife, existence value of the salmon, the benefit of children and young relatives, bequest value (future generations), which all generally represent non-use motivations, and seeing more fish, an expression of use motivations. Therefore, a strong element of both non-use and use value is therefore involved.

In Question 28a respondents were asked "To ensure that this scheme for the River Wye did go ahead, would you be willing to contribute any money, no matter how little or how much?" The results are shown in Table 6-25.

Table 6-25 Respondents' Willingness to Contribute (Question 28a)

Agency Region	Willing to Contribute	Not Willing	Depends	Don't Know
Southern	27%	55%	12%	6%
South West	19%	69%	12%	0%
Wales	20%	61%	17%	2%
Thames	23%	67%	9%	1%
Midlands	38%	44%	16%	3%
Anglian	12%	74%	10%	5%
North West	11%	77%	11%	1%
North East	10%	78%	8%	4%
Total	20%	66%	12%	2%

Note: Based on full sample of 843 respondents

The figures in Table 6-25 are fairly consistent with the data shown in Table 6-24. Indeed, as it might be noted in Table 6-25, the majority of respondents (62%) answered that they would not benefit from improvements in the River Wye, and alike, the majority (66%) are not willing to contribute.

Table 6-26 outlines the reasons stated by those respondents, as to why they would be unwilling to pay for the scheme on the river Wye to go ahead.

Table 6-26 Reasons for Bid Refusals (Question 29)

Reasons	Percentage	Strategic
More important things	21%	No
Cannot afford	21%	No
Not important issue	18%	No
Gov. should pay	17%	Yes
Too far away	15%	No
Rather give to other charities	10%	No
Rather pay with different method	3%	Yes
Concern over money destination	3%	Yes
Should be funded by local water authority	2%	Yes
Complaint	1%	Yes
Not affected	1%	No
Anglers should pay	1%	Yes
Depends on amount	1%	Yes
Fishing is cruel	0%	No
Other	7%	Yes/no
Don't Know	2%	No

Note: Based on full sample of 843 respondents

As in Scenario 1, those respondents who claimed to benefit but who refused to offer a payment were analysed in terms of why they refused to pay. Table 6-26 shows how each motive for non-payment was treated. Those respondents seen to give a strategic reason were further analysed with respect to their environmental attitudes and socio-economic characteristics. As a result, sixteen protest bidders were taken out from the sample, leaving a total of 827 respondents.

As in Scenario 1, the interviewees were allowed to select the payment vehicle from a list of alternatives. Their choices are presented in Figure 6-9.

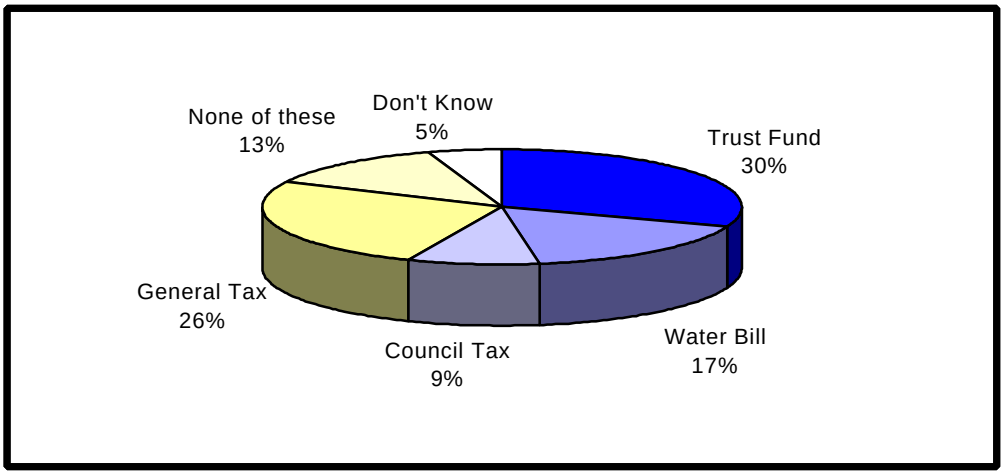


Figure 6-10 Preferred Payment Method (Question 28b)

The figures, reported in Figure 6-9, reveal that over half (52%) of the sample chose coercive payment methods (general tax, council tax, water bills). As already explained in the analysis of Scenario 1, coercive payment methods guarantee more reliable results, in other words results that are less likely to be influenced by strategic behaviours or hypothetical bias. Allowing respondents to select a trust fund reduces the potential bias sometimes linked to taxes and rates.

Question 30 (WTP question) asked respondents "Bearing in mind your financial constraints and the other things you would like to spend your money on, which of the amounts on the card would be the MAXIMUM amount of money you would be willing to pay EVERY YEAR, through the preferred payment method to ensure that the River Wye scheme went ahead?"

Table 6-27 shows the regional and national average WTP estimates for benefits accruing from the restoration of salmon population in the river Wye, based on responses to Question 30.

Table 6-27 Willingness to Pay for the River Wye Improvement Scheme (Question 30)

Agency Region	Sample size	Average WTP (£/hse/yr)	5% truncated sample WTP (£/hse/yr)	10% truncated sample WTP (£/hse/yr)
Southern	81	£5.26	£2.94	£1.71
South West	78	£3.13	£1.71	£0.84
Wales	79	£4.23	£1.95	£1.18
Thames	141	£3.42	£1.55	£1.12
Midlands	119	£7.79	£4.73	£3.69
Anglian	83	£2.05	£1.01	£0.53
North West	117	£2.30	£0.81	£0.30
North East	114	£1.05	£0.59	£0.31
Total sample	827	£3.63	£1.76	£1.32

If the mean WTP figures in Table 6-27 express mainly non-use values, we would expect them to be smaller than the WTP estimates presented in Table 6-17 for Scenario 1. The mean WTP values for each region and for the entire sample are indeed consistently lower in Scenario 2 than those in Scenario 1.

Table 6-28 presents the WTP values for visitors and non-visitors of the Wye.

Table 6-28 WTP Value for Visitors and Non-Visitors of the Wye (Question 30)

Visitors of the Wye	Respondents	WTP (£/hse/yr)
Visited	262	£4.91
Not Visited	560	£3.59
Don't Know	5	£1.67

The results are interesting and are broadly consistent with theoretical expectations. Indeed, those individuals who have not visited the river, on average, have a lower WTP value (£3.59) compared to the WTP value of those who have visited the River (£4.91). Those people that have visited a site previously may be more likely to hold a higher non-use value for that site than those who have not visited it.

Table 6-29 presents WTP values split into categories indicating the likelihood of future visits to the River Wye. Sub-samples are obtained using the responses to Question 24.

Table 6-29 WTP Value Based on Likelihood of Visiting the Wye in the Future (Question 30)

Likelihood of visiting the site in the future	All Respondents[1]	All Respondents' WTP (£/hse/yr)	Respondents who have not previously visited the Wye[2]	Respondents who have not visited[2] WTP (£/hse/yr)
Definitely	89	£7.70	10	£13.90
Probably	121	£6.53	41	£10.11
Maybe	220	£4.61	157	£4.75
Definitely not	291	£1.61	270	£1.29
Don't Know	106	£3.24	82	£3.49
Total	827	£3.63	560	£3.59

Note1: Based on full sample of 843 respondents less the 16 protest bidders
Note2: Based on those respondents who stated not to have visited the Wye

Again, results presented in Table 6-29 are consistent with theoretical expectation. Indeed, the more likely respondents are to visit the Wye, the higher they bid for the scheme to preserve its salmon population. If the respondents who have never visited the Wye are considered (columns 4 and 5 in Table 6-29), results show a similar pattern to those of the entire sample. The WTP of the sub-sample of respondents who are "*definitely not*" going to visit the river can be considered as expressing a purely non-use value. Those who are "*definitely*" going to visit effectively have a high degree of option value.

6.6 Validity and reliability analysis for Scenario 2

6.6.1 Payment Principle Analysis

Question 28a is the payment principle question, and as in Scenario 1, analysis of this question helps in finding out which factors influence the willingness to contribute towards the implementation of the river Wye scheme. A probit model is again adopted and is as follows:

$$prob(y_j \neq 0 \mid x_j) = \underset{(2.6)}{0.43} + \underset{(2.41)}{0.07}Edu + \underset{(-7.62)}{0.59}Benefit \qquad (7)$$

Values in brackets are z values. The robustness of this model was tested using Likelihood Ratio (LR) test, and again the null hypothesis is that the two variables have no influence in the

decision undertaken by respondents as to whether or not they will pay something towards improving or maintaining fish populations on the River Wye. The critical value in this case is 5.99, and the LR of equation 7 is 68.00, which shows a high level of significance of the two variables in the decision.

Edu variable in the above model indicates that better education enhanced the probability that respondents were willing to contribute.

The sign of the *Benefit* variable shows how individuals who had stated they would benefit from the implementation were more likely to be willing to pay. This result is consistent with theoretical expectation.

6.6.2 General Statistics

General statistics relating to the WTP are provided in Table 6-30. The values show a high degree of variance.

Table 6-30 Relevant Statistics for Average WTP values

Average WTP	Standard deviation	Median	Variance	95% Confidence interval
£3.63	13.6	0	184.9	2.94 to 4.8

6.6.3 Regression Analysis

The data presented in Table 6-30 suggests that a high variance of responses is affecting the results of this scenario. The assessment of the reliability is again carried out using semi-log form.

$$LnWTP = \underset{(3.18)}{1.27} + \underset{(3.25)}{0.27}Env + \underset{(3.7)}{0.36}Wildlife - \underset{(1.6)}{0.32}Noqualific - \underset{(1.61)}{0.25}sex \qquad (8)$$

Where

LnWTP:	Natural Log of Maximum Willingness to Pay
Envi:	Importance of environmental issues
Wildlife:	Importance of improved wildlife
Sex:	Sex of the respondent
Noqualific:	No formal qualification

Again, use of the logarithm of the WTP values means that model 8 focuses on explaining the variation of positive bids only.

Values in brackets are modules of t values. Overall, the t values show that *Wildlife* and *Envi* variables in the model are significant (at 99% level) whereas *Sex* and *Noqualific* are only significant at the 80% level; being included for theoretical interest. The overall model shows a low explanatory value. Indeed, the adjusted R^2 is 10.33%. The results of this study cannot therefore be considered completely reliable. This is a fairly disappointing result, but may either be due to some particular feature of the questionnaire or simply due to the nature of what is being valued (people may have a problem with the market scenario proposed). However, as indicated before low adjusted R^2 are typical of open-ended experiments (Bateman et al., 1999).

The *Envi* variable refers to how important the respondents perceived the environment to be compared with other social issues. The sign of this variable indicates that respondents, who thought the environment to be important, were likely to bid higher amounts of money. This is consistent with theoretical expectations. Indeed, individuals who are keener on the environment are more likely to be willing to pay more for the protection or improvement of environmental goods. However, it may simply reflect the "warm glow", as explained in Section 6.4.3.

Wildlife indicates that those respondents who stated that they gained from an improved wildlife in the Wye were likely to be willing to pay more. Similar argument to those for *Envi* above can be expressed

Noqualific shows how individuals without formal qualification are likely to bid a lower WTP value. This result is consistent with the result that higher education positively affects the likelihood of a positive WTP.

Sex shows how male individuals offer a higher amount of money. This is an interesting result that does not have a straightforward interpretation.

6.6.4 Sample Size Analysis

Based on a sample size analysis approach (Mitchell and Carson, 1989), it can be said that 90% of the time true WTP will be within 40% of the estimated WTP. This again shows the relative lack of reliability of the results.

Table 6-31 Sample Size Analysis

Respondents No.	Coefficient of variation V	Confidence limit α	Deviation Δ
827	3	90%	40%

6.7 Socio-economic Characteristics Analysis

The questionnaire concluded by asking several questions aimed at collecting information to help assess the representativeness of respondents. It should be noted that the sample was screened at a national level to ensure an appropriate mix of respondents. The screening process used national quotas. The respondents' selection was carried out consistently with those quotas and therefore the sample is, at a national level, representative of social classes, sex, working status, age and regional population distributions in England and Wales.

The national quotas used were as follows: 49% of respondents were to be within ABC1 social class and 51% within C2DE social class. 49% were to be male and 51% female. 52% of the respondents should be working full time or part time, and 48% should be not working. 36% of respondents were to be between 18 and 34 years old, 37% between 35 and 54 years old and 27% over 55 years old.

Regional population data were adjusted in order to achieve a reasonable sample size for the less populated regions. The adjustment resulted in interviewing relatively more respondents in the South West, Wales and Anglian regions than would have been interviewed using a directly proportional population basis.

Questions 31a and 31b were asked in order to determine any links between WTP values given and angling activities undertaken. They asked respondents "Which of the following statements best applies to you?" and Question 31b "Which of the following statements best applies to any other member of your household, close family or partner?" Responses to the statements offered are reported in Table 6-32. Any relationship there was was insufficient to be included within the payment principle analysis or regression model.

Table 6-32 Sample Angling Behaviours (Question 31 a, b)

Statement	Applies to the respondent	Applies to family or close friend
Regularly gone fishing in the past	5%	4%
Occasionally gone fishing in the past	14%	13%
Currently go(es) fishing	7%	29%
Do(es) not go fishing now, did in the past	8%	5%
Do(es) not go fishing now, but likely in the future	4%	2%
None of the above	63%	46%
Don't Know	0%	0%

Question 32 then asked: ***"How close to either your home or work place is the nearest water body (i.e. main river, lake or canal) that you visit?"*** Responses are shown in Table 6-33.

Table 6-33 Proximity to the Site from Home or Work (Question 32)

Distance	Number Respondents	Percentage
Overlooking it	43	5%
Within ¼ Mile	111	13%
1/4 Mile to 1	190	23%
1 to 5 Miles	289	34%
6 to 20 Miles	147	17%
21 to 50 Miles	11	1%
51 to 100 Miles	9	1%
Over 100 Miles	1	0%
Don't Know	42	5%
Total	843	100%

It is worth noting that Table 6-7 presented the distance of the respondent's homes from the reference water body. Comparison of the two Tables reveals a close similarity

Table 6-34 reports the results of Question 33 regarding respondents' membership of environmental groups on a regional basis.

Table 6-34 Environmental Group Membership (Question 33)

Agency Region	Environmental Organisation Membership
Southern	9%
South West	13%
Wales	11%
Thames	7%
Midlands	8%
Anglian	2%
North West	10%
North East	5%
Average	8%

Figures in Table 6-34 show that the rate of affiliation is on average 8%, and that it varies widely on regional basis, with Anglian and North East having particularly low membership.

Question 35 asked respondents ***"Please could you tell me using one of the letters on this card, which category your Gross Household Income comes into?"*** Show card 21 listed several income ranges. Responses to Question 35 are reported in Table 6-35.

Table 6-35 Income (Question 35)

Agency Region	Less than £5000 a year	£5000-£9999	£10000-£14999	£15000-£24999	£25000-£39999	£40000-£60000	Over £60000	Refuse	Don't Know
Southern	11%	15%	18%	22%	15%	4%	1%	9%	6%
South West	10%	10%	4%	20%	12%	4%	5%	27%	10%
Wales	13%	17%	6%	21%	10%	6%	2%	17%	7%
Thames	12%	11%	12%	24%	14%	3%	2%	10%	12%
Midlands	4%	5%	12%	18%	21%	7%	2%	20%	12%
Anglian	12%	13%	5%	18%	19%	2%	1%	20%	10%
North West	10%	8%	10%	22%	15%	3%	2%	22%	8%
North East	2%	6%	8%	24%	13%	3%	1%	31%	14%
Total	9%	10%	9%	21%	15%	4%	2%	19%	10%
Total (adjusted)	13%	14%	13%	30%	21%	6%	3%		
National[1]	9%	27%	24%	30%	6%	2%	1%	0	0

Note: Based on full sample of 843 respondents
Note[1]: Source: Annual Abstract of Statistics 1999

The data in Table 6-35 shows that almost 30% of respondents were either not certain about their household gross annual income (10%) or did not want to state it (19%).

In order to allow comparison at a national level the average values were adjusted by redistributing proportionally those who did not state their income. The results indicate a reasonably representative sample, although slightly biased towards a wealthier population.. In order to analyse the representativeness of data on regional basis, the figures reported in the regional competitiveness indicators published by the DTI in February 2000 were used.

The data in Table 6-36 shows the ratio of each regional households' average gross income determined for the study sample compared to the average national gross income for the

sample. In the same way, the ratios of regional household disposable income per head as presented in the DTI study compared to the national average disposable income per head. Although the two income figures express different estimates (gross income and disposable income after tax), the comparison seems to be reasonable.

Table 6-36 Relative Weight of Regional Household Disposable Income Per Head and Gross Regional Income

Agency Region	Sample Statistics	National Statistics[1]
Southern	0.88	1.12
South West	1.12	1.02
Wales	0.91	0.87
Thames	0.92	1.18
Midlands	1.20	0.92
Anglian	0.92	1.11
North West	0.98	0.91
North East	1.07	0.86

Note 1: based on the Regional Competitiveness Indicators, DTI

Results in Table 6-36 show that overall the income distribution within the sample differs from the true distribution within the Regions. This reduces the reproducibility of the results of this study and the their use in an aggregation exercise. Therefore, in the economic model construction it is crucial to consider the differences between the population and sample values.

Question 34 asked respondents **"Please could you tell me which qualifications on this card you have".** Show Card 20 was then shown to the interviewees. Responses to question 34 are reported in Table 6-37.

Table 6-37 Education (Question 34)

Agency Region	No formal qualification	O Level/GCSE or equivalent	A level or equivalent	Professional or[1] equivalent
Southern	32%	32%	10%	27%
South West	33%	33%	7%	26%
Wales	27%	21%	12%	40%
Thames	29%	26%	15%	31%
Midlands	23%	33%	13%	31%
Anglian	40%	21%	11%	27%
North West	26%	29%	20%	25%
North East	25%	35%	10%	30%
Total England	29%	30%	13%	28%
DfEE England[2]	15%	43%	18%	23%[4]
Total Wales	27%	21%	12%	40%
DfEE Wales[3]	20%	42%	17%	20%[5]

Note: Based on full sample of 843 Respondents.
Note1: These figures are obtained summing the individuals with a degree, professional qualification or other qualification
Note2,3: Source DfEE Statistical first release (Autumn 1999)
Note4,5: These figures are obtained by summing level 4 and 5 in the DfEE document

Results in Table 6-37 show that overall the England sub-sample is fairly representative. This sub-sample is slightly biased towards less educated people. Individuals with *no formal*

qualification represent 29% of the interviewees, whereas they represent only 15% of the English population.

The Welsh sub-sample is characterised by a wider difference between the sample and the actual national population. Indeed, individuals with higher degrees or professional qualifications are over-represented in the sample (40%) compared to the national statistics (20%). This is likely to have inflated the average WTP of the Welsh respondents. The model presented in equation 6 showed that having a professional qualification or a higher degree influenced positively the WTP values. Therefore particular attention needs to be paid as to how representative the regional sub-samples are with respect to professional status. The comparison is shown in Table 6-38.

Table 6-38 Professional or Higher Degree

Agency Region	National Statistics	Sample Statistics
Southern	27.0%	27%
South West	24.0%	26%
Wales	20.0%	40%
Thames	30.0%	31%
Midlands	20.0%	31%
Anglian	22.0%	27%
North West	20.0%	25%
North East	17.0%	30%

Note: Source of National Data DfEE first release (Autumn 1999)

The results in Table 6-38 show that the representativeness of the sub-samples varies widely across the regions. For instance, the Southern region is perfectly represented, whereas in Wales and the Midlands, professionals are over-represented.

Again these differences have to be accounted for in the economic model in Section 7.5.

7 THE ECONOMIC MODELS

7.1 Coarse Angler Consumers' Surplus

This paper model has been developed based on differentials in average willingness to pay values for various different factors for coarse angling. These differentials have been converted into "adjustment factors" which can be used to multiply an overall national average value for angler consumers' surplus, to provide a more site-specific value. The resulting values cannot be considered as highly accurate, but represent reasonably adequate ball park values.

The results of this contingent valuation study gave an overall national average willingness to pay value for coarse angler consumer surplus of £2.83 per trip.

The adjustment factors have been calculated by dividing the average WTP value per trip for each subcategory (e.g. for each water body type) by the overall average angler consumer surplus of £2.83 per trip. To give a more conservative value, use £2.10 or £1.70 based on 5% and 10% trimmed WTP figures.

As shown in Table 7-1 **Adjustment Factors for Determining Coarse Angler Consumers' Surplus.**, key factors that affect the WTP value include region, type of water body, fishery quality and water quality. Other potential factors such as income, age, social class and education cannot be readily determined by fishery managers for specific sites. They have thus been omitted from this relatively simplistic paper model. The number of substitute sites nearby was also found not to affect the average WTP.

Table 7-1 Adjustment Factors for Determining Coarse Angler Consumers' Surplus.

Agency Region	Factor	Water Body	Factor	Fishery Quality[1]	Factor	Water Quality[1]	Factor
Southern/Thames	1.20	River	1.10	Good	1.06	Good	1.04
Anglian	1.13	Canal	0.95	Mod/Poor	0.88	Mod/Poor	0.90
South West/Wales	1.10	Lake	0.85				
North West	0.92						
Midlands	0.85						
North East	0.81						

Note[1] See Table 7-2 below for definitions

Table 7-2 Definition of Factors

Factor	Category	Definitions
Fishery quality	Good	Many and/or large fish
	Mod/Poor	Moderate/few fish in number and size
Water quality	Good	Little or no pollution, clear, many fish, good vegetation
	Mod/Poor	Litter present, sometimes smells, few fish and little vegetation

For example, the consumer surplus for angler's fishing in the North West on a canal known to be a moderate/poor fishery and with good water quality would have a value as follows:

£2.83 x 0.92 x 0.95 x 0.88 x 1.04 = £2.26

Based on this model, the highest value for angler consumers' surplus would be £4.12 for a river in the Southern/Thames, with a good fishery and good water quality.

The lowest value for angler consumers' surplus would be £1.54 for a lake in the North East with a poor fishery and poor water quality.

7.2 Game Angler Consumers' Surplus

The model for game was conducted in the same way as above. However, due to the limited overall sample size (160) there were insufficient sub-sample sizes to determine adjustment factors at a regional level. The results for other sub-samples are shown in Table 7-3, with the overall national average WTP consumer surplus value for game anglers being £3.56 per trip.

The trout and salmon sub-samples were also assessed separately. This exercise revealed a significant difference between the two average WTP values. The trout anglers (116 respondents) had an average willingness to pay of £ 3.06 per trip, whereas the salmon anglers (44 respondents) were willing to pay on average £ 4.87 per trip. In order to take this difference into account, a further factor is introduced for the type of fish being caught. This is calculated in the same way as explained in Section 7.1.

Table 7-3 Adjustment Factors for Determining Game Angler Consumers' Surplus.

Fish	Factor	Water Body	Factor	Fishery Quality	Factor	Water Quality	Factor
Salmon	1.4	River	1.16	Good	1.06	Good	1.04
Trout	0.9	Lake	0.84	Mod/Poor	0.88	Mod/Poor	0.90

Using the above adjustment factors, a river with a good salmon fishery and good water quality would give an average WTP consumer surplus of £6.37. On the other hand, a lake with poor trout fishery and water quality would have an average consumer surplus of £2.13.

7.3 Problems with Angler Consumers' Surplus Models

It should be noted that the WTP values provided by respondents might be affected by various biases. In particular there may have been strategic bias in that anglers may think that if they give an honest and high value, they may be requested to pay it in increased licence fees. On the other hand, some anglers may have strategically given a higher value in the belief that more Government money may be spent on fisheries. It is probably more likely that the former bias is true, and so lower than true willingness to pay values are recorded.

The WTP values also refer to the angler's most used site. In this respect, the values are not truly average or representative. However, they are likely to be reasonably representative since these trips will account for the vast majority of angling trips.

It is worth noting that the WTP values may also include an element of option and existence value, in that they represent how much anglers are willing to pay to maintain the existing quality of their angling site. This "good" was used as a close measure or proxy for "consumer surplus". Some respondents may consider within their valuation some degree of benefit relating to the future or even non-use.

The actual number of anglers affected by any change to a waterbody is critical to any calculation of loss of economic value. The appropriate aggregation of values will depend on issues such as distance that anglers live away from the site and availability of alternative nearby fishing locations. This aggregation issue deserves further consideration and study.

7.4 Angler Contribution to Local Economy

It has not been possible to model angler's expenditure and the contribution of angling to rural and urban economies. As explained in Section 1.2, this was due to the need to focus more on consumer surplus in the telephone questionnaire. However, it is possible to use some of the data provided by the study to indicate the overall national significance of angling.

Table 7-4 Angler's Annual Expenditures

Component	Coarse (£)	Game (£)
Club fees	64	106
Permits	72	154
Competition	54	5
Equipment	380	156
Books	37	31
Food	42	42
Accommodation	52	44
Travel	158	144
Total	**859**	**682**

Given that there are approximately 2.3 million coarse anglers (NRA, 1994), total expenditure relating to angling in England and Wales may be in the order of £1,976 million (almost £2 billion).

Likewise, given that there are approximately 0.8 million game anglers (NRA, 1994), total expenditure relating to angling in England and Wales may be in the order of £545 million.

7.5 General Public Values for Fish in their Nearest Waterbody

This paper model has been developed based on differentials in average annual household willingness to pay (WTP) values for various factors for improving or preserving fish populations at the respondents' nearest water body. These differentials have been converted into "adjustment factors" which can be used to multiply an overall national average value for the General Public, to provide more site-specific value. The 5% truncated WTP value is used to be on the conservative side given the difficulties of valuing an environmental good such as fish stocks.

The results of the contingent valuation study gave an overall national average 5% trimmed willingness to pay value to improve or maintain fish population through stocking and fish habitat improvements at the nearest site of £3.73 per household per year.

The adjustment factors for regional area, water body type and site fish population improvements have been calculated by dividing the trimmed average WTP value for each subcategory (e.g. for each waterbody type) by the overall average trimmed average WTP value of £3.73.

The adjustment factors for the different regions were evaluated using the ratio between the weighted WTP value for the region and the overall national value of £3.73. The regional WTP values were also weighted according to representativeness of the regional sub-samples' income levels and possessing of a professional qualification (see Table 6-37 and Table 6-38).

These two variables, income and possession of a professional qualification, were chosen because of their influence in the respondents' decision of their maximum WTP value, and the mis-representation of some of the regional samples.

As shown in Table 7-5, key factors that are assumed to affect the WTP value include region, type of water body, and fish population improvement. Other potential factors such as income, age, social class and education cannot be readily determined by fishery managers for specific sites. They have thus been omitted from this relatively simplistic paper model. Other factors found to affect the WTP value as identified in the regression analysis also cannot readily be determined by fishery managers.

Table 7-5 Adjustment Factors for Determining General Public Values of Fish Population Improvements for Nearest Waterbody

Agency Region	Factor	Water Body	Factor	Improvement in fish population	Factor
South/SE	1.35	River	1.15	None to Few	1.39
South West	1.13	Lake	0.95	Few to Reasonable	0.63
Wales	0.80	Canal	1.06	Reasonable to Good	1.20
Thames	1.74			Maintain Good	1.39
Midlands	0.77				
Anglia	0.94				
North West	0.44				
North East	0.15				

Note: See Table 2 below for definitions

Table 7-6 Definition of Factors

Factor	Category	Definitions
Fish population quality	Good	Many and/or large fish
	Reasonable	Moderate fish in number and size
	Few	Few fish in number and size
	None	No fish can be spotted in the water body

For example, the general public value for improving fish populations in a Southern Region lake from reasonable to good would have a value as follows:

£3.73 x 1.35 x 0.95 x 1.2 = £5.74 per house per year

Based on this model, the highest value for general public value would be £10.37 per house per year for a river in the Thames region, whose fish population was either improved from no fish to a few, or maintained at a good level.

The lowest general public value would be £0.33 per house per year in the North East for a lake where the fish population was improved from poor to reasonable.

It is feasible that fish populations may change more than one band at a time, for example, going from a good population to no fish, or vice versa. The total change in welfare can be calculated by adding together each of the relevant fish population improvement factors and multiplying by the waterbody factor, the regional factor, and the base WTP value. For

example, in the South West, a river that changes from no fish to many fish would have the following value:

£3.73 x 1.13 x 1.15 x (1.39 + 0.63 + 1.2 + 1.39) = £22.35 per house per year.

One could argue that there is a diminishing marginal benefit from each additional level or band of fish population improvement. Alternatively however, one could argue that the overall change from no fish to many fish is of greater value than the sum of the parts.

In applying the model, the actual population benefiting from the values needs careful consideration. One must bear in mind that the values relate to the nearest waterbody. Other nearby waterbodies may also have a similar, albeit smaller, value for the general public. Until further studies investigate this issue in more detail, the following approach is recommended. The values should apply to all households within a catchment area demarcated by a line drawn equidistant between the waterbody affected and the next nearest waterbody.

Alternatively, based on data in Table 6-7, the values could relate to households within 20 miles of the waterbody in question. The results indicate that 86% of people live within 20 miles of the waterbody they selected for the study. The issue of other waterbodies nearby should also be considered.

This whole issue of what population to include in the aggregation is extremely important and must be considered in further research.

7.6 Problems with the General Public Values

It should be noted that the model outlined in Section 7.5 above should be viewed with a healthy degree of scepticism. The contingent valuation scenarios developed for this study were a fairly ambitious attempt to obtain values that could be applied in various situations and circumstances. Consequently, the model is based on a relatively simplistic approach based on average willingness to pay values, which are affected by various other site specific, questionnaire design and sample-related factors that have not been explored in depth.

However, the model can be assumed to be a reasonable estimate. This data is certainly the best available on the subject to date. It may be worth further research in this area to confirm the accuracy of the results obtained in this study.

The relationship between fish population improvements and changes in water quality is also rather unclear. For example, considerable care would be needed in determining a value for changes in both water quality and fish populations. There is a strong possibility of double counting unless great care is taken.

7.7 General Public Values for the River Wye Salmon Population

The contingent valuation study for the River Wye salmon populations has provided some interesting information on the willingness to pay of the general public for specific improvements to a specific site. The research has clearly shown that people do have a value for fish populations in waterbodies well away from where they live, and that their value is strongly linked to “option value”.

However, the results are considered too site-specific and case-specific to develop a general valuation model that can be applied to all waterbodies and fish populations. The River Wye and its salmon population are of national importance. The general public is likely to have a much smaller WTP value for other UK waterbodies and fish populations further afield from where they live. However, for other waterbodies within their region, of a similar stature and importance, there could easily be a similarly sized value. This last concept has not been investigated in this study.

Alternatively, the results can and should be used to demonstrate that such non-use and option values do exist. The values can be referred to in similar cases as an indication of potential order of magnitude values.

Based on the values determined in this study, it could be argued that the national benefit accruing to the general public from improvements in the salmon population by means of a habitat improvement scheme on the River Wye is around £40 million per year. This is calculated based on multiplying the best estimate average WTP (5% trimmed) values by the number of households in each region (see Table 7.7).

However, due to the uncertainty and relatively poor reliability of the values, it is worth highlighting that this value could be considerably lower, or indeed higher. Based on an approach to assess the reliability of WTP values from different samples sizes (Mitchell and Carson, 1989), upper (£67 million) and lower (£15 million) values were calculated and are reported in Table 7.7. The confidence interval column shows what percentage of occasions the estimated WTP values will be within the true WTP value. The confidence interval was based on the coefficient of variation (standard deviation/mean) and sample size for each sub-sample.

Table 7-7 Overall Value of Improvements to the River Wye Salmon Population from a Habitat Improvement Scheme

Agency Region	Households (millions)	WTP (£/hse/year)			Annual Benefits (millions)			Confidence Interval
		Lower	Central	Higher	Lower	Central	Higher	Percentage
Southern	2	£0.06	£2.94	£5.82	£0.12	£5.88	£11.64	95%
South West	2	£0.32	£1.71	£3.10	£0.63	£3.42	£6.21	90%
Wales	1.2	£0.04	£1.95	£3.86	£0.05	£2.34	£4.63	95%
Thames	4.8	£0.79	£1.55	£2.31	£3.80	£7.44	£11.08	90%
Midlands	3.2	£2.80	£4.73	£6.66	£8.97	£15.14	£21.30	90%
Anglian	2.4	£0.19	£1.01	£1.83	£0.45	£2.42	£4.40	90%
North West	2.8	£0.15	£0.81	£1.47	£0.42	£2.27	£4.12	90%
North East	3.2	£0.11	£0.59	£1.07	£0.35	£1.89	£3.43	90%
Total	**21.6**	**£0.68**	**£1.89**	**£3.09**	**£14.78**	**£40.80**	**£66.81**	**90%**

Note: Based on Environment Agency regional population data – and assuming 2.5 people per household.

It should be noted that the average regional WTP values used above have not been adjusted with respect to socio-economic characteristics, as they were for the nearest water-body scenario. The WTP statistical analysis for the Wye scenario revealed only a slight correlation of WTP with “no formal qualifications” and none with “income”. No other strong correlations were found.

8 CONCLUSIONS

The questionnaire surveys have clearly demonstrated that there are substantial economic benefits relating to angling activities and fish populations in inland waterbodies in the UK.

8.1 Angler Consumers' Surplus

The national angler survey undertaken for Module B revealed that a conservative estimate of average consumer surplus per angling trip is around £2.10 for coarse fishing and £2.70 for game fishing. This value represents the additional value gained per angler for each angling trip they take, as measured by their willingness to pay more for it.

It must be recognised that the accuracy of this value is uncertain, mainly due to possible strategic behaviour by the anglers answering the questionnaires. Anglers are likely to be wary of expressing their full willingness to pay because they feel that the licences are likely to go up, and they may not personally reap any greater benefits from it. It demonstrates:

- That anglers gain more benefit from angling than they actually pay for.
- That anglers would probably be willing to contribute more towards maintaining or improving their existing quality of angling at their usual or favourite angling locations, as long as they thought the money was spent appropriately. However, there are probably many relatively poor anglers (e.g. students, unemployed, retired and lower social classes) who may not be willing to, or able to, contribute more than they already do.

8.2 Angler Expenditure

Expenditure by anglers on angling related goods and services on an annual and per trip basis is substantial. The average annual expenditure for coarse angling is £859, although the median is £314. The median provides a more conservative estimate. Given that there are approximately 2.3 million coarse anglers (NRA, 1994), total expenditure relating to coarse angling in England and Wales may be in the order almost £2 billion. The average expenditure per trip for coarse angling is £17, although the median is £10.

The average annual expenditure for game anglers is £682 and the median is £276. Likewise, given that there are approximately 0.8 million game anglers (NRA, 1994), total expenditure relating to game angling in England and Wales may be in the order of £545 million. The average expenditure per trip for game anglers is £27 and the median is again £10.

It must be recognised that angling expenditure should not be used as an economic value in themselves. They do, however, indicate the significance of angling, and can be used for assessing impacts to a local or regional economy relating to changes in angling participation.

When using the above data in an economic analysis, great care must be taken to consider any local or regional transfers in consumer surplus and expenditures when assessing changes in angling participation. For example, if developing a new angling waterbody, or if there is loss of an existing fishery, there may be little overall economic impact if anglers simply switch from, or go to, another nearby water-body.

8.3 General Public Values of Local Waterbodies

The general public survey revealed that individuals are willing to pay small amounts (average £3.73/house/year) to maintain or improve the size and number of fish in their nearest waterbody. When multiplied up and aggregated for the population local to a waterbody, these values may be considerable. It is interesting to note that 85% of respondents lived within 20 miles of the water body they selected as the nearest waterbody that they knew well. It is also worth noting that 52% of respondents claim to at least sometimes observe the fish in their nearest waterbody.

This value in theory reflects the amount of money that local people would be prepared to contribute if they thought it would really make a difference to their local fish populations. Alternatively, it also reflects a reasonable amount of compensation for loss of non-user value that could be paid to rehabilitate a damaged fishery. Such values are useful in cost-benefit analysis when assessing the value of impacts relating to different development option or environmental enhancement projects, and for natural resource damage assessments.

However, care must be taken in using the values for several reasons. Firstly, it is important to realise that only 54% of all respondents were willing to pay something, many were not. Secondly, because an element of the willingness to pay may actually relate to the contribution to a good cause (the warm glow effect). And thirdly, the relative importance of the good to be evaluated with respect to other environmental goods may have not been fully understood (scope insensitivity).

8.4 General Public Values of the River Wye Fishery

The general public survey of the River Wye suggests an annual benefit of £40 million for enhancing the river to improve salmon numbers to their original levels of ten or so years ago. The actual value is quite uncertain, as is indicated by the high and low estimates. If other waterbodies were included in the questionnaire, the value per site would probably be significantly reduced. However, the value may be of a similar magnitude for other waterbodies of similar stature.

For this survey, only 20% of all respondents were willing to pay for the improvements. People in the Midlands (38%) and Southern (27%) regions were most likely to contribute.

8.5 General

It is vital therefore to remember that the values obtained specifically relate to the actual scenario and wording used in the questionnaires, and are based on existing budget constraints at the time of the questionnaire. Considerable care should be used in applying these values to other situations. They provide ballpark estimates only. To obtain more reliable values would require site-specific valuation studies.

An economic model has been developed for assessing the impact of changes in local fish populations on angler consumers' surplus and the general public's values for fish in their favourite or nearest waterbody. The models represent a simplistic but reasonable approach to assessing changes in economic value relating to different levels of improvements in fish populations for different regions and for different waterbodies.

8.6 Recommendations

As stated above, it is essential to realise that the values elicited are limited to the context in which they were determined. Furthermore, because valuation of environmental non-use values is in its infancy, the general public values determined in this study simply provide a useful first attempt at quantifying such values associated with inland fish. As a result, there is a need to use appropriate caution when applying the values. Ideally an experienced economist should oversee any serious application of the data provided in this study. Specific points relating to the different values determined are as follows:

- Angler consumer surplus values may be considered as being reasonably robust, albeit probably on the conservative side.
- The general public's value for fish in their nearest water body should be used with care, particularly with respect to what populations are used for the aggregation of benefits, and the extent of other nearby inland waterbodies.
- Values for the Wye must be used with the greatest caution of all, particularly if trying to apply them to other waterbodies.

In terms of application of the values, there is scope for using or adapting the information for use in:

- Damage assessments for pollution of waterbodies, in particular in relation to the impending EU Directive on Environmental Liability.
- Justifying enhanced expenditure on fishery management and waterbody improvements.
- Project appraisals where there are potential impacts to fish stocks and angling activities.
- Helping to assess the economic value of waterbodies as part of the Water Framework Directive.

However, there is also a need for further related studies in order to:

- Confirm the reliability of the general public values identified in this study. This should be achieved by carrying out further more site-specific contingent valuation or stated preference studies.
- Obtain a better understanding of which households to aggregate non-use values for. To apply the values properly it is essential to know in more detail how the values are affected by distance from a site (i.e. distance decay). Again, this may be achieved by conducting more in-depth contingent valuation studies.
- With respect to aggregating changes related to angler values, each application will require a degree of site-specific data in terms of how the change will affect angler behaviour. Issues such as how the values are affected by distance from a site (i.e. distance decay) and the availability of substitute sites will be important. Generalised data on this could be determined through an appropriate study.

- Explore the relationship between the public's preferences and values for inland fish, and other associated conservation values such as water quality, other plant and animal species.
- Assess the value of inland fisheries with respect to wider social benefits, not least relating to health and education.

Appendix A Angler Survey CATI Questionnaire

Job: _____ (1-4) Serial: _____ (5-8)
Card: 01 (9-10)

NATIONAL ANGLERS QUESTIONNAIRE

INTRO Good morning/afternoon/evening. My name is ... from PAS an independent market research agency. We are currently conducting a telephone survey on behalf of the Environment Agency to find out angler's attitudes towards fishing in the UK. Could I speak to someone in the house who has held an angling license during the past year.

Repeat if necessary: Good morning/afternoon/evening. My name is .... from PAS an independent market research agency. We are currently conducting a telephone survey on behalf of the Environment Agency to find out angler's attitudes towards fishing in the UK.

The study is purely research. One of the main aims is to assess and demonstrate the overall economic benefit of angling to the Government.

Would you be willing to help us with your opinions? It will take about 15 minutes.

IF NECESSARY SAY: There is absolutely no selling involved in this and all of the information collected is strictly confidential.

	(11)	SP
YES	1	CONTINUE
NO	2	EXIT
RESPONDENT NOT AVAILABLE	3	EXIT
MAKE FIRM APPOINTMENT	4	

SEX INTERVIEWER: PLEASE RECORD SEX OF RESPONDENT

	(12)	SP
Male	1	
Female	2	

AGE Please could you tell me in which of the following age categories you fall? **READ OUT**

	(13)	
Under 16	1	EXIT
16-29	2	
30-39	3	
40-49	4	
50+	5	
Refused	6	

(14) SPARE

Q1 Which of the following types of angling do you participate in within England or Wales? Please state whether you do them usually, occasionally or never.

READ OUT

	(15-19) SP		
	Usually	Occasionally	Never
Salmon	1	2	3
Sea trout	1	2	3
Brown and/or rainbow trout (plus Grayling)	1	2	3
Coarse (i.e all other inland fish)	1	2	3
Sea Angling	1	2	3

Q2 Which of the following type of waterbodies do you fish within England or Wales? Please state whether you fish them usually, occasionally or never.

READ OUT

	(20-23) SP		
	Usually	Occasionally	Never
Lakes	1	2	3
Canals	1	2	3
Rivers	1	2	3
Sea	1	2	3

Q3a Which of the following Environment Agency licenses have you had in the past 12 months?

READ OUT

	(24) SP	
	Yes	No
A game license	1	2

IF YES, CONTINUE. ALL OTHERS GO TO Q3c

Q3b Was that a….

	(25-28) SP	
	Yes	No
Full game (salmon/sea trout) license	1	2
Concession game license	1	2
8 day game license	1	2
1 day game license	1	2

GO TO Q4

Q3c Have you held a non-migratory trout or coarse license in the last 12 months?

(29) SP	
Yes	No
1	2

IF YES, CONTINUE. ALL OTHERS GO TO Q4

Q3d Was that a….

	(30-33) SP Yes	No
Full coarse license	1	2
Concession coarse license	1	2
8 day coarse license	1	2
1 day coarse license	1	2

Q4 Which of the following fishery types, in terms of access, do you use within England or Wales? Please state whether you use them usually, occasionally or never.

READ OUT	(34-38) SP Usually	Occasionally	Never
Free public fisheries	1	2	3
Free private fisheries (free but restricted access)	1	2	3
Club/association fisheries	1	2	3
Day ticket fisheries	1	2	3
Syndicate fisheries	1	2	3

Q5 On average how many times a year do you go angling in England or Wales?
READ OUT

	(39) SP
1-5	1
6-15	2
16-30	3
31-50	4
51 – 100	5
More than 100	6
Don’t know	9

Q6 For each of the following what is your approximate average annual expenditure directly relating to your angling activities in England or Wales?
DO NOT READ OUT (1)£0 (2)£1-25 (3)£26-50 (4)£51-100 (5)£101-200(6)£201-500 (7)£501-1000 (8)£1,000–3,000 (9)Over £3,000 (0)Don't know

	(40-47) SP
Angling club and syndicate membership	1 2 3 4 5 6 7 8 9 0
Permits (weekly/daily)	1 2 3 4 5 6 7 8 9 0
Competition fees	1 2 3 4 5 6 7 8 9 0
Bait, angling equipment & specialist clothing	1 2 3 4 5 6 7 8 9 0
Angling books, magazines etc	1 2 3 4 5 6 7 8 9 0
Food purchased whilst on your trip	1 2 3 4 5 6 7 8 9 0
Accommodation away from home	1 2 3 4 5 6 7 8 9 0
Travel fares/petrol	1 2 3 4 5 6 7 8 9 0

IF RESPONDENT UNSURE OF PETROL COSTS

PROMPT: What is your best estimate? Get them to work out figure based on a typical trip at 30p per mile, and multiply by the number of trips taken.

Q7a I am going to ask you about some reasons people give for going fishing. When you go fishing, how important to you is…… **INSERT FROM BELOW**

Would you say that it was very important, fairly important, neither important nor unimportant, not very important, or not at all important?

		V Imp	F Imp	N/N	NV Imp	Not Imp
Relaxation	(48)	1	2	3	4	5

For remaining questions:

Using the same scale, how important to you is….. **INSERT FROM BELOW**

ROTATE

Getting away from people/family	(49)	1	2	3	4	5
Being with friends/family	(50)	1	2	3	4	5
The variety of fish species in the water	(51)	1	2	3	4	5
The number of fish you catch	(52)	1	2	3	4	5
The size of the fish you catch	(53)	1	2	3	4	5
Keeping the fish you catch	(54)	1	2	3	4	5
Seeing signs of fish	(55)	1	2	3	4	5
Taking part in competitions	(56)	1	2	3	4	5
The surrounding wildlife	(57)	1	2	3	4	5
The site's visual attractiveness	(58)	1	2	3	4	5
Fishing just as something to do	(59)	1	2	3	4	5

Q7b Do you have any other important reasons for going fishing?

(60) SP
Yes 1 go to Q7c
No 2 skip to Q8

IF YES:
Q7c What are these?

RECORD IN FULL

(61-70) MP

The next questions relate to an inland water-body in England or Wales that you fish most often. Remember that the aim of these questions is to help us assess the full economic benefit of angling to the country.

Q8 Thinking of the site you fish at most often. What type of water-body is it? Remember, we are talking about **inland** water-bodies. NOTE: If respondent doesn't have a regular site – refer to the site fished at **last time**. If respondent doesn't usually fish inland, refer to their **last inland** experience.
READ OUT

(71) SP
Lake (reservoir/gravel pit).....1
Canal.....2
River (or stream).....3
Other inland water-body(Specify) 4

Q9 What type of fishing do you usually undertake at this site?
READ OUT

(72) MP

Salmon and/or sea trout.....1
Brown and/or rainbow trout 2
Other inland fish (e.g perch, roach, pike, chub).....3
Other (Specify) 4

Q10 In your opinion, what is the quality of the fishery like at this site, in terms of the number, size, and diversity of the fish there?
READ OUT

(73) SP

Good (i.e many and/or large fish).....1
Moderate (i.e moderate number and size).....2
Poor (i.e few and/or small fish).....3
Don`t know.....9

Q11 In your opinion, which of the following best describes the general water quality there?
NOTE: In terms of presence/absence of pollution
READ OUT

(74) SP

Very good.....1
Good (little or no pollution, clear, many fish, good vegetation).....2
Reasonable.....3
Fair (Some litter, rarely smells, some fish and vegetation).....4
Poor (a lot of litter, usually smelly, sewage, no fish).....5
Don`t know.....9

Q12a How far is this site from where you live?
READ OUT

(75) SP

within 1 mile.....1
1 – 5 miles.....2
6 – 20 miles.....3
21 – 50 miles.....4
51 - 100 miles.....5
101 – 200 miles.....6
Over 200 miles.....7
Don`t know.....9

Q12b Are there any **other** angling sites within the same distance of your home as your regular site that could provide you with a similar level of enjoyment? Would you say there were…..

READ OUT

(76) SP

Many (e.g 6 or more).....1
Some (e.g 3-5).....2
Few (e.g 1-2).....3
None.....4
Don't know.....5

Q13 Thinking back to the site where you fish most often, what percentage or proportion of all your annual angling trips are at this site?

(77-79)

_____%

If necessary use information below to help elicit a response
100% (All)
75% (three-quarters)
50% (half)
25% (quarter)
10% (a little)
Don`t know

(80) SPARE

Job: _____ (1-4) Serial: _____ (5-8)
Card: 02 (9-10)

IF RESPONDENT INDICATED THEY SPENT NOTHING IN Q6, GO TO Q16

Q14 For each of the following items, roughly how much do you spend on average for each days fishing at your **regular site**?
READ OUT (1)£0 (2)£1-10 (3)£11-25 (4)£26-50
(5)£51-100 (6)£101-200 (7)£201-500 (8)Over £500
(9) Don't know

IF NECESSARY, PROMPT PETROL COSTS AT 30p PER MILE

	(11-14)								SP
Permits/fees per day	1	2	3	4	5	6	7	8	9
Food/drink purchased whilst on your trip .	1	2	3	4	5	6	7	8	9
Accommodation away from home.....	1	2	3	4	5	6	7	8	9
Travel fares/petrol.....	1	2	3	4	5	6	7	8	9

Q15 Bearing in mind your annual and daily fishing costs relating to your **regular site**, how much value for money do you get from fishing there?

READ OUT

	(15) SP
A great deal	1
A fair amount	2
A little	3
None at all	4
Don`t know	5

The next few questions will refer to financial contributions. Please remember that this is purely a research exercise. We just want your honest opinions. Your individual answers will not be passed on to anybody.

Q16 In order to **guarantee** that the **existing quality** of the fishing at your regular site was **maintained in its current state**, in terms of fish numbers, diversity, and size, would you be willing to pay any additional money, however small or large, to a fund specifically set up to do this?

	(16) SP	
Yes	1	Go to Q17A
No	2	**SKIP TO Q19**
Don't know	3	Go to Q17A

Q17a What would be the maximum sum of money you would be willing to pay each trip to **guarantee** maintaining existing quality of the fishing at your regular site, in terms of fish numbers, diversity, and size?

(17-19) SP

Sum (write in) _____£/trip. Go to 18

Don't know Go to 17b

Q17b Which of the following sums of money would you be willing to pay each trip to maintain the existing quality of the fishery at that site. Please answer yes or no to each sum I read out.

READ OUT

	(20-29) SP Yes	No
£10	1	2
£1	1	2
£100	1	2
£5	1	2
£50	1	2
£0.50	1	2
£250	1	2
£2.50	1	2
£25	1	2
Don`t know	1	2

Q18 How important are the following reasons in determining the amount you would contribute? Would you say it was very important, fairly important, neither important nor unimportant, not very important, or not at all important?

READ OUT
ROTATE

It represents the value for money you currently feel you get from fishing at the site……

It would ensure that you can continue fishing there in the future as you do now…….

Knowing that other anglers can continue fishing there as they do now…….

Knowing that future generations can fish there as you do now……

	(30-33) SP
Very important	1
Fairly important	2
Neither important nor unimportant	3
Fairly unimportant	4
Very unimportant	5
Don’t know	6

MISS OUT Q 19

ONLY THOSE SAYING NO AT Q 16

Q19 Why did you say no? **DO NOT PROMPT**

(34-42) SP

It’s not that important an issue/don`t care about it...1
Cannot afford to pay anything 2
There are more important things to spend money on.....3
The Government/Environment Agency should pay.....4
Depends how much.....5
Concern over how the money would actually be spent.....6
Rather give money to other charities.....7
Pay too much already/don’t want license increase.....8
Other (Specify).....9

Finally, to help us to analyse the results, there are a few more general questions we would like to ask you.

Q20 Are you a member of any environment or conservation related organisations?

(43) SP

IF YES, PROBE TO CLARIFY

Yes (Angling related).....…..1
Yes (General i.e RSPB, Friends of the Earth etc,)2
No.....3
Don't know.....0

Q21 Which of the following qualifications do you have?
READ OUT

(44) MP

O level/GCSE or equivalent qualification.....1
A level or equivalent qualification.....2
Degree or equivalent qualification.....3
Professional or equivalent qualification.....4
DO NOT READ
Other.....5
None of these.....6

WSTATUS WORKING STATUS: Do you work full time or part time?
CODE ONE ANSWER ONLY

(45) SP

Full time (30+ hours a week).....1
Part time (8-29 hours per week).....2
Non-working (less than 8 hours per week).....3
Unemployed.....4
Retired.....5
In education.....6
Refused.....7

CLASS1 What is the occupation of the main income earner in you household?
PLEASE PROBE AND TYPE IN, EG if pensioner do they have a private or state pension. If private pension what was your previous job? If manager probe for responsibilities and qualifications?

(46-53)

(54)

Refused.....1

CLASS2 INTERVIEWER: PLEASE CODE OCCUPATION

The response to the previous question was ...

(55) SP

A.....1
B.....2
C1.....3
C2.....4
D.....5
E.....6

Q22 Which of the following categories does your gross household income come into? READ OUT

(56) SP

Less than £15,000 a year.....1
Between £15,000 and £30,000 pounds a year.....2
Between £30,000 and £60,000.....2
Over £60,000 a year.....3
Refused.....4

RECON Sometimes we like to get back to people for research purposes. Bearing in mind that all information is strictly confidential, would you be willing to be re-interviewed sometime in the future?

(57)

Yes.....1

No.....2 GO TO CLOSE

QNAME Could I please take your name?

(58-61)

Thank you very much for your time and help. As I said, I'm calling from PAS. If you would like to check any details concerning this survey or the company, I can give you a number to contact.

IF YES CONCERNING THE SURVEY:-
The number if 0181 782 3000 and the executive responsible is Mark Finnegan. If you would like to contact this number you may reverse the charges.

CONCERNING THE COMPANY:-
Dial 0500 396999 and ask for the Market Research Society

THANK RESPONDENT AND CLOSE

QTEL INTERVIEWER: PLEASE ENTER TELEPHONE NUMBER

ENTER YOUR TELEPHONE NUMBER WITH NO SPACES EG 0705123456

(62-65)

END This is the end of your interview.
Make a note of your respondent number ***%NO%***

Now go back and check your responses << takes you back to the beginning.

I certify that this is a true record of an interview for this survey with a person unknown to me and has been conducted within the Market Research Society code of conduct

(66) SP

Yes.....1

Appendix B General Public Face-to-Face Questionnaire

NATIONAL PUBLIC FISH SURVEY - MAIN QUESTIONNAIRE

SECTION A – ENVIRONMENTAL ATTITUDES AND ACTIONS

Good morning/afternoon/evening. My name is ……. from Public Attitude Surveys Ltd (SHOW ID) and we are carrying out a national survey on behalf of the Environment Agency to find out people's attitudes towards environmental issues. It will take about 20 – 30 minutes. Would you be willing to help us with your opinions?

YES A **CONTINUE**
NO B

IF 'NO', RECORD REASON ON COUNT SHEET , THANK AND CLOSE

SHOW CARD 1

Q.1 Do you think in general that more or less money should be spent by the country as a whole on maintaining and improving the following in England and Wales?

TICK & ROTATE START POINT – THEN READ OUT –			MUCH MORE	SOME-WHAT MORE	NO MORE OR LESS	SOME-WHAT LESS	MUCH LESS	DON'T KNOW
	A	Public transport	1	2	3	4	5	9
	B	Education	1	2	3	4	5	9
	C	Historic buildings and archaeological sites	1	2	3	4	5	9
	D	Hospitals and health	1	2	3	4	5	9
	E	The natural environment	1	2	3	4	5	9
	F	Reducing unemployment/ crime	1	2	3	4	5	9

SHOW CARD 2

Q.2 In your opinion, how important is the general quality of the environment for each of the following in England and Wales?

TICK & ROTATE START POINT – THEN READ OUT –			VERY IMPOR-TANT	FAIRLY IMPOR-TANT	NEITHER IMPORTANT NOR UNIMPORTANT	FAIRLY UNIMPOR-TANT	VERY UNIM-PORT-ANT	DON'T KNOW
	A	Woodlands and forests	1	2	3	4	5	9
	B	Canals	1	2	3	4	5	9
	C	Beaches and the sea	1	2	3	4	5	9
	D	Nationally important wildlife sites and parks	1	2	3	4	5	9
	E	Rivers and streams	1	2	3	4	5	9
	F	Local parks	1	2	3	4	5	9
	G	Lakes	1	2	3	4	5	9

SHOW CARD 2

Q.3 How important do you think it is to maintain and improve the following features of rivers, lakes and canals?

		TICK & ROTATE START POINT – THEN READ OUT –	VERY IMPOR-TANT	FAIRLY IMPOR-TANT	NEITHER IMPORTANT NOR UN-IMPORTANT	FAIRLY UN-IMPOR TANT	VERY UN-IMPOR TANT	DON'T KNOW
	A	Water quality	1	2	3	4	5	9
	B	The **range** of different **types** of duck and bird species	1	2	3	4	5	9
	C	The **range** of different **types** of fish species	1	2	3	4	5	9
	D	Access for the public	1	2	3	4	5	9
	E	The level of water	1	2	3	4	5	9
	F	The amount of plants and flowers	1	2	3	4	5	9
	G	The overall **number** of ducks and birds	1	2	3	4	5	9
	H	The **size** and overall **number** of fish	1	2	3	4	5	9

SHOW CARD 3

Q.4 How often on average do you do each of the following activities in England and Wales either in, on or next to inland water bodies (i.e lakes, rivers and canals).

		TICK & ROTATE START POINT – THEN READ OUT –	NEVER	RARELY	SOMETIMES	OFTEN	DON'T KNOW
	A	Walk, jog or cycle	1	2	3	4	9
	B	Picnic, sit or sunbathe	1	2	3	4	9
	C	Enjoy wildlife	1	2	3	4	9
	D	Go fishing	1	2	3	4	9
	E	Look at or notice fish	1	2	3	4	9
	F	Boat, windsurf, canoe or row	1	2	3	4	9

SECTION B SCENARIOS

I am now going to give you some information about freshwater fish and inland fishing activities in England and Wales. I will then ask you to consider two **completely separate** situations that we would like your opinions on.

SCENARIO 1

SHOW CARD 4
This is the first scenario
Please read through these details.
ALLOW RESPONDENT TO READ THROUGH AT OWN PACE
ENSURE THEY READ THROUGH TO THE END

Q.5a Can you think of the nearest inland water-body (ie. stream, river, lake or canal but not a pond) in England or Wales to where you live, that you know reasonably well?

Yes 1 **GO TO NOTE ABOVE Q.6**
No 2 **GO TO Q.5b**

Q.5b Can you think of one particular inland water-body (ie. a stream, river, lake or canal but not a pond) in England or Wales that you visit more often than any other?

Yes 1 **GO TO NOTE ABOVE Q.6**
No 2 **GO TO Q.5c**

Q.5c Can you think of any one inland water-body in England or Wales that you know quite well or at all? (IF STILL NO – SUGGEST THE RIVER THAMES)

Yes 1 **GO TO NOTE ABOVE Q.6**
No 2 **GO TO SCENARIO 2**

I now want you to think carefully of the site you named (or one location of it), and picture it in your mind. I would now like to ask you a few questions about it.

Q.6a Is it a stream, river, lake, or canal?

Stream/river 1
Lake (or reservoir 2
Canal 3
Don't know 9

Q.6b Roughly how many other rivers, lakes and canals do you know reasonably well that are within about 15 miles or so from the site?

IF NECESSARY PROMPT READING OUT ANSWERS BELOW

None 0
One 1
Two 2
Three to five 3
Six or more 4
Don't Know 5

Q.7 What is its name? (**CODE 1 & WRITE IN**)

_____

Don't know 9

SHOW CARD 5

Q.8 How close is it to where you live?

OVERLOOKING IT .	1
WITHIN ¼ MILE	2
¼ MILE UP TO 1 MILE	3
1 MILE – 5 MILES	4
6 MILES– 20 MILES	5
21 MILES – 50 MILES	6
51 MILES – 100 MILES	7
OVER 100 MILES	8
DON'T KNOW	9

SHOW CARD 6

Q.9 On average, how many times a year do you visit it?

100+ A YEAR/TWICE A WEEK OR MORE	1
ABOUT 50 TIMES A YEAR/ONCE A WEEK	2
ABOUT 25 TIMES A YEAR/ONCE A FORTNIGHT	3
ABOUT 12 TIMES A YEAR/ONCE EVERY MONTH	4
ABOUT 6 TIMES A YEAR/EVERY OTHER MONTH	5
ABOUT 3-4 TIMES A YEAR	6
ONCE OR TWICE A YEAR	7
NEVER	8
DK	9

SHOW CARD 7

Q.10 How often do you do the following at the site?

TICK & ROTATE START POINT – THEN READ OUT –			NEVER	OCCAS-IONALLY	USUALLY	ALWAYS	DON'T KNOW
	A	Walk, jog or cycle	1	2	3	4	9
	B	Eat, drink, picnic, sit or sunbathe	1	2	3	4	9
	C	Enjoy the wildlife	1	2	3	4	9
	D	Go fishing	1	2	3	4	9
	E	Look at or notice the fish	1	2	3	4	9
	F	Boat, windsurf, canoe or row	1	2	3	4	9

SHOW CARD 8

Q.11 In your opinion which of the following best describes the general water quality there?

POOR/BAD:(A LOT OF LITTER, USUALLY SMELLY, SEWAGE, NO FISH, LITTLE OR NO VEGETATION)	1
FAIR: (SOME LITTER, RARELY SMELLS, SOME FISH, SOME VEGETATION)	2
REASONABLE	3
GOOD: (LITTLE OR NO POLLUTION, CLEAR, MANY FISH, GOOD VEGETATION)	4
VERY GOOD	5
DON'T KNOW	9

SHOW CARD 9

Q.12 Which of the following statements are true?
CODE ALL THAT APPLY

I HAVE NEVER SEEN ANY FISH ALIVE IN THE WATER	1
I HAVE SEEN FISH IN THE WATER	2
THERE ARE SOMETIMES A FEW ANGLERS THERE	3
THERE ARE SOMETIMES MANY ANGLERS THERE	4
I HAVE NEVER THOUGHT ABOUT THE FISH IN THE WATER	5
I KNOW THAT IT IS STOCKED WITH FISH	6
I HAVE SEEN DEAD FISH THERE	7
NONE OF THE ABOVE	8

Q.13 Can you name any types of fish that you know or think live there?
DO NOT PROMPT – CODE ALL THAT APPLY

Barbel	1
Bleak	2
Bream	3
Burbot	4
Catfish	5
Chub	6
Carp	7
Dace	8
Eel	9
Gudgeon	0

Grayling	1
Lamprey	2
Minnow	3
Perch	4
Pike	5
Roach	6
Rudd	7
Salmon	8
Shad	9
Stickleback	0

Tench	1
Trout (Brown)	2
Trout (Rainbow)	3
Trout (Sea)	4
Zander	5
Don't know if there are any fish	6
Don't know names of fish in the water	7
Other (**WRITE IN AND CODE**)_____	9

SHOW CARD 10

Q.14 In your opinion, which of the following do you think best describes the fish population living in the water there?

NONE	1	**GO TO Q.15a**
POOR (ONLY A FEW AND SMALL SIZE)	2	**GO TO Q.15b**
REASONABLE (REASONABLE NUMBER & SIZE)	3	**GO TO Q.15c**
GOOD (MANY AND LARGE)	4	**GO TO Q.15d**
SOME FISH, BUT NO IDEA HOW MANY	5	**GO TO Q.15c**
DON'T KNOW	9	**GO TO Q.15b**

Q.15a Do you think you personally would benefit in any way if actions were taken to permanently increase the fish population in the water-body from none to a few small fish. The actions might include improving the habitat for fish to live and breed in, and putting in more fish, although assume that the water quality would not change.

Yes	1	**GO TO Q.16**
No	2	**GO TO Q.18**
Depends	3	**GO TO Q.16**
Don't know	9	

Q.15b Do you think you personally would benefit in any way if actions were taken to permanently increase the amount of fish in the water-body from a few small fish to a reasonable number and size. The actions might include improving the habitat for fish to live and breed in, and putting in more fish, although assume that the water quality would not change.

Yes	1	**GO TO Q.16**
No	2	**GO TO Q.18**
Depends	3	**GO TO Q.16**
Don't know	9	

Q.15c Do you think you personally would benefit in any way if actions were taken to permanently increase the amount of fish in the water-body from a reasonable number and size to many and large fish. The actions might include improving the habitat for fish to live and breed in, and putting in more fish, although assume that the water quality would not change.

Yes	1	**GO TO Q.16**
No	2	**GO TO Q.18**
Depends	3	**GO TO Q.16**
Don't know	9	

Q.15d Do you think you personally would benefit in any way if actions were taken to permanently maintain the many and large fish population in the water body. The actions would include improved management to ensure that no pollution, damaging or overfishing incidents occurred which would reduce fish numbers, although assume that the water quality would not change.

Yes	1	**GO TO Q.16**
No	2	**GO TO Q.18**
Depends	3	**GO TO Q.16**
Don't know	9	

SHOW CARD 11

Q.16 How much do you think that **you personally** might benefit from such actions in terms of increased satisfaction or enjoyment?

NOT AT ALL	1	**GO TO Q.18**
A LITTLE	2	
A FAIR AMOUNT	3	
A LOT	4	**GO TO Q.17**
DEPENDS	5	
DON'T KNOW	9	

Q.17 In what way, or ways, do you think **you personally** would benefit?
DO NOT PROMPT – CODE ALL THAT APPLY

Will not benefit	1
Knowing there are more fish	2
Seeing more fish	3
Improved wildlife	4
Angling improved for me now	5
Angling improved for others	6
Angling improved for me in future	7
Children/young relatives benefiting	8
Future generations benefiting	9
Improved water quality/swimming (SEE NOTE BELOW*)	0*
Other (CODE & WRITE IN)	_____
Don't know	V

***NOTE:** IF THEIR RESPONSE MENTIONS ANYTHING TO DO WITH "IMPROVEMENT IN WATER QUALITY/SWIMMING" – CODE, THEN REMIND THEM THAT THE ACTIONS WOULD NOT RESULT IN A CHANGE IN WATER QUALITY AND ASK IF THEY WANT TO MENTION ANYTHING ELSE AS WELL.

ASK ALL
SHOW CARD 12

Q.18 I would now like you to think again about how you might benefit. Please think carefully and say in which of the following ways, if any, **you personally** might benefit from such actions through your own increased **satisfaction or enjoyment.**

TICK & ROTATE START POINT – THEN READ OUT –			NOT AT ALL	A LITTLE	A FAIR AMOUNT	A LOT	DON'T KNOW
	A	Just knowing that there are more fish there	1	2	3	4	9
	B	Knowing you might be able to see more fish there	1	2	3	4	9
	C	Knowing the wildlife has improved there	1	2	3	4	9
	D	Knowing that angling has improved for you	1	2	3	4	9
	E	Knowing that angling has improved for others	1	2	3	4	9
	F	Possibly being able to go fishing there yourself in the future	1	2	3	4	9
	G	Knowing that your children/young relatives might benefit	1	2	3	4	9

SAY: Before I ask you the next question, can I remind you that we are only asking your **opinions** in this research…

Q.19a To ensure that the actions did go ahead to *improve* OR *maintain* the fish populations in the water body you are talking about, would you be willing to contribute any money, no matter how little or how much?

Yes	1	**GO TO Q.19b**
Depends	2	
No	3	**GO TO Q.20**
Don't know	9	**GO TO Q.19b**

SHOW CARD 13

Q.19b Which of the following methods of payment would you prefer to fund the scheme: please choose ONE option from this card.

THROUGH A TRUST FUND	1	
THROUGH HOUSEHOLD WATER BILLS	2	
THROUGH THE COUNCIL TAX	3	**GO TO Q.21**
THROUGH GENERAL TAXES	4	
NONE OF THESE	5	**GO TO Q.20**
DON'T KNOW	9	**GO TO Q.21**

ASK ALL THOSE SAYING NO AT Q.19a OR NONE OF THESE AT Q.19b

Q.20 Why do you say no/don't know/none of these.

DO NOT PROMPT, CODE TO NEAREST ANSWER OR WRITE IN UNDER OTHER. CODE UP TO 3 MENTIONS THEN GO TO NEXT SCENARIO

Rather pay by different method	1
It's not that important an issue/don't care about it	2
Cannot afford to pay anything	3
There are more important things to spend money on	4
The government/other should pay	5
Depends how much	6
Concern over how the money would be spent	7
Rather give money to other charities	8
Complaint about trust funds/bills/taxes	9
Don't know	0

Other (**CODE 1 AND WRITE IN**) _____

ALL WHO ANSWERED Q20 SKIP TO Q.22
ALL OTHERS ASK Q21

SHOW CARD 14

Q.21 Bearing in mind your financial constraints and the other things you would like to spend your money on, which of the amounts on the card would be the **MAXIMUM** amount of money you would be willing to pay **EVERY YEAR**, through your preferred payment method to ensure that the scheme went ahead?

10P	1
25P	2
50P	3
£1	4
£2	5
£5	6
£7.50.	7
£10	8
£15	9

£20	1
£25	2
£30	3
£40.	4
£50	5
£75	6
£100	7
£150	8
£200	9

OTHER (CODE & WRITE IN) _____ 0

Confirm amount willing to pay by saying:
"So you would be willing to pay £ (INSERT AMOUNT) every year towards the scheme"

Q.22 Thinking about the environment generally, which one environmental concern would you most like to see addressed in the UK?

SINGLE CODE ONLY

Global warming	1
Loss of animals/plants	2
Loss of habitat	3
Oil pollution	4
Nuclear power	5
Marine pollution	6
Freshwater pollution	7
Air pollution	8
Safety of food	9
Litter/waste disposal	0

Other (**CODE 1 AND WRITE IN**) _____

SCENARIO 2

SHOW CARD 15
I would now like you to consider a completely different Scenario
Please read through these details.
ALLOW RESPONDENT TO READ THROUGH AT OWN PACE
ENSURE THEY READ THROUGH ALL 3 PAGES
LEAVE SHOW CARD IN FRONT OF RESPONDENT THROUGHOUT SCENARIO

Q.23 Have you ever visited the River Wye?

Yes	1
No	2
Don't know	9

Q.24 Are you likely to ever visit the River Wye in the future?

Definitely	1
Probably	2
Maybe	3
Definitely not	4
Don't know	9

Q.25 Do you think that you personally would benefit in any way, in terms of increased satisfaction or enjoyment, if the scheme were to go ahead, and salmon numbers returned to their former levels.

Yes	1	**GO TO Q.26**
No	2	**SKIP TO Q.27**
Depends	3	**GO TO Q.26**
Don't know	9	

SHOW CARD 12

Q.26 How much do you think that **you personally** might benefit from the River Wye scheme in terms of increased satisfaction or enjoyment?

NOT AT ALL	1
A LITTLE	2
A FAIR AMOUNT	3
A LOT	4
DEPENDS	5
DON'T KNOW	9

SHOW CARD 16

Q.27 I would now like you to think a little more about how you might benefit. Which of the following ways, if any, might **you personally** benefit from this scenario on the River Wye through your own increased **satisfaction or enjoyment.**

TICK & ROTATE START POINT – THEN READ OUT –			NOT AT ALL	A LITTLE	A FAIR AMOUNT	A LOT	DON'T KNOW
	A	Knowing that future generations would benefit	1	2	3	4	9
	B	Knowing that your children/young relatives might benefit	1	2	3	4	9
	C	Possibly being able to go fishing there yourself in the future	1	2	3	4	9
	D	Knowing that angling has improved for others	1	2	3	4	9
	E	Knowing that angling has improved for you	1	2	3	4	9
	F	Knowing the wildlife has improved there	1	2	3	4	9
	G	Knowing you might be able to see more fish there	1	2	3	4	9
	H	Just knowing that the salmon population will remain high	1	2	3	4	9

SAY: Before I ask you the next question, can I remind you that we are only asking your **opinions** in this research…

Q.28a To ensure that this scheme for the River Wye did go ahead, would you be willing to contribute any money, no matter how little or how much?

Yes	1	**GO TO Q.28b**
Depends	2	
No	3	**GO TO Q.29**
Don't know	9	**GO TO Q.28b**

SHOW CARD 17

Q.28b Which of the following methods of payment would you prefer to fund the scheme if the scheme on the River Wye were to go ahead: please read through and chose ONE option from this card.

THROUGH A TRUST FUND	1	
THROUGH HOUSEHOLD WATER BILLS	2	
THROUGH THE COUNCIL TAX	3	**GO TO Q.30**
THROUGH GENERAL TAXES	4	
NONE OF THESE	5	**GO TO Q.29**
DON'T KNOW	9	**GO TO Q.30**

ASK ALL THOSE SAYING NO AT Q.28a OR NONE OF THESE AT Q.28b

Q.29 Why do you say no/DK/none of these.

DO NOT PROMPT,CODE TO NEAREST ANSWER OR WRITE IN UNDER OTHER.
CODE UP TO 3 MENTIONS THEN GO TO SECTION C

Rather pay by different method	1
It's not that important an issue/don't care about it	2
Cannot afford to pay anything	3
There are more important things to spend money on	4
The government/other should pay	5
Depends how much	6
Concern over how the money would be spent	7
Rather give money to other charities	8
Complaint about trust funds/bills/taxes	9
Don't know	0

Other (**CODE 1 AND WRITE IN**) _____

ASK ALL THOSE SAYING CODES 1-4 OR CODE 9 AT Q.28b. ALL OTHERS GO TO Q.31
SHOW CARD 14

Q.30 Bearing in mind your financial constraints and the other things you would like to spend your money on, which of the amounts on the card would be the **MAXIMUM** amount of money you would be willing to pay **EVERY YEAR**, through your preferred payment method to ensure that the River Wye scheme went ahead?

10P 1
25P 2
50P 3
£1 4
£2 5
£5 6
£7.50 7
£10 8
£15 9

£20 1
£25 2
£30 3
£40 4
£50 5
£75 6
£100 7
£150 8
£200 9
OTHER (CODE & WRITE IN) _____0

Confirm amount willing to pay by saying:
"So you would be willing to pay £ (INSERT AMOUNT) every year towards the scheme"

SHOW CARD 18

Q.31a Which of the following statements best applies to you?
CODE ONE ONLY IN GRID BELOW UNDER Q.31a

Q.31b Which of the following statements best applies to any other member of your household, close family or partner? **CODE ALL THAT APPLY IN GRID BELOW UNDER Q.31b**

	Q.31a	Q.31b
Have regularly gone fishing in the past but no longer do so	1	1
Have occasionally gone fishing in the past but no longer do so	2	2
Currently go(es) fishing	3	3
Do(es) not currently go fishing, but did so in the past and may do so again in the future	4	4
Do(es) not currently go fishing but may do so in the future	5	5
None of the above	9	9

SECTION C SOCIAL INFORMATION

ASK ALL **SHOW CARD 19**

Q.32 How close to either your home or work place is the nearest water body (i.e. main river, lake or canal) that you visit?

OVERLOOKING IT.	1
WITHIN ¼ MILE	2
¼ MILE UP TO 1 MILE	3
1 MILE – 5 MILES	4
6 MILES– 20 MILES	5
21 MILES – 50 MILES	6
51 MILES – 100 MILES	7
OVER 100 MILES	8
DON'T KNOW	9

Q.33 To help us to analyse the results, there are four more general questions we would like to ask you - Are you a member of any environment related organisation, for example, Greenpeace or a local environmental group?

Yes	1
No	2
Don't know	9

SHOW CARD 20

Q.34 Please could you tell me which of the qualifications on this card you have?

NO FORMAL QUALIFICATIONS	1
O LEVEL/GCSE OR EQUIVALENT	2
A LEVEL OR EQUIVALENT	3
DEGREE OR EQUIVALENT	4
PROFESSIONAL OR EQUIVALENT	5
OTHER	9

SHOW CARD 21

Q.35 Please could you tell me using one of the letters on this card, which category your Gross Household Income comes into? **IF NECESSARY ASK FOR BEST ESTIMATES**

J – LESS THAN £5,000 A YEAR	1
P - £5,000 - £9,999 A YEAR	2
M - £10,000 - £14,999 A YEAR	3
S - £15,000 - £24,999 A YEAR	4
K - £25,000 - £39,999 A YEAR	5
R - £40,000 - £60,000 A YEAR	6
T – OVER £60,000 A YEAR	7
REFUSED	8
DON'T KNOW	9

Q.36 Finally I would like to ask you what you thought about the questionnaire: was it….

	YES	**NO**	**DON'T KNOW**
Interesting	1	2	9
Realistic	1	2	9
Understandable	1	2	9
Too long	1	2	9
Too complicated	1	2	9

THANK RESPONDENT AND GO TO CLASSIFICATION

CARD 4

General Fish and Fishing Information

Please read:

- **There are 38 different types of freshwater fish in British waters.**
- **Two types are rare, three are vulnerable and three are endangered.**
- **The number and size of inland fish is reducing in many waters.**
- **There are also many other plants, birds, mammals, insects and other animals that are rare and endangered in Britain and need protection.**
- **Angling is a popular recreational activity that depends on there being plenty of fish in inland waters.**
- **There are around 40,000 km of rivers and canals in England and Wales, of which about two thirds are fished by anglers.**
- **There are also around 40,000 lakes and large ponds of which almost half are fished.**
- **Last season, 33,000 angling licences were sold in England and Wales for salmon and sea-trout fishing and 1.2 million licences were sold to anglers fishing for course fish (other types of inland fish).**

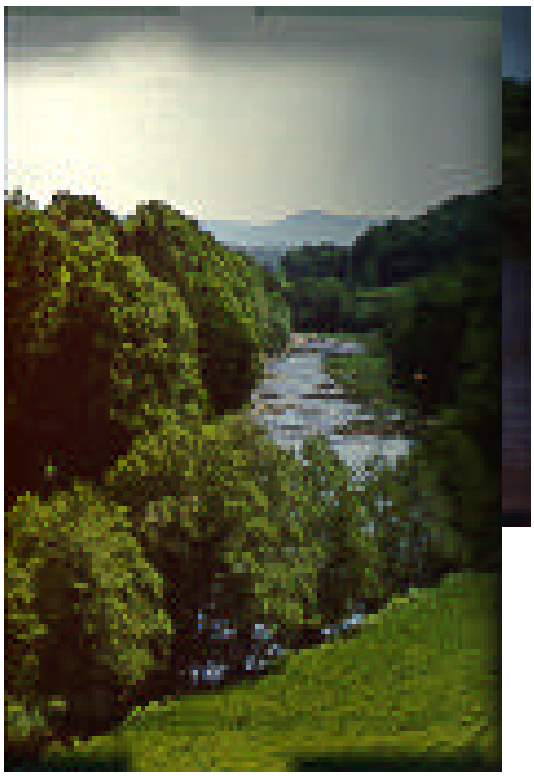
CARD 15

Scenario 2 – The River Wye

There are about 20 main rivers in Wales and 30 in England that support populations of wild salmon and sea trout, and where angling for them is popular.

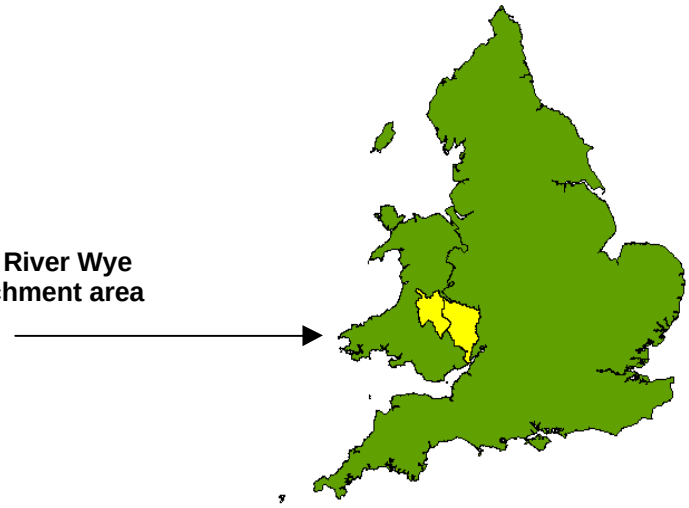
This is a wild salmon.

This is a typical angler fishing for salmon.



These photos show the River Wye, an important salmon river in the UK.

The River Wye catchment area



This map shows the catchment area for the River Wye.

As you can see it covers quite a large area both in England and Wales.

Unfortunately, over the past ten or so years, for a number of reasons there has been a major decline in the number of salmon in the River Wye.

Salmon numbers have also declined in most other rivers in England and Wales.

Over the past ten years the number of Salmon caught by anglers each year on the River Wye has fallen from around 6,000 to sometimes less than 1,000, a reduction of around 80%.

As a result, a scheme may be carried out on the River Wye to improve the habitat for the salmon and hopefully increase the number of salmon back to their former levels.

The scheme would involve various different actions, and be undertaken by the Environment Agency together with a group of other organisations.

Debris being returned to the Nant Ffrancon

The actions may include putting in large rocks, as in the photo above, to act as shelter for the salmon. Other long-term actions may include restoring the riverbank, improving the salmon breeding areas and stocking with juvenile salmon.

SHOW CARD A

UNDER 18

18 - 34

35 - 54

55 – 74

75+

SHOW CARD A

75+

55 – 74

35 - 54

18 - 34

UNDER 18

SHOW CARD 1

MUCH MORE

SOMEWHAT MORE

NO MORE OR LESS

SOMEWHAT LESS

MUCH LESS

SHOW CARD 1

MUCH LESS

SOMEWHAT LESS

NO MORE OR LESS

SOMEWHAT MORE

MUCH MORE

SHOW CARD 2

VERY IMPORTANT

FAIRLY IMPORTANT

NEITHER IMPORTANT NOR UNIMPORTANT

FAIRLY UNIMPORTANT
VERY UNIMPORTANT

SHOW CARD 2

VERY UNIMPORTANT

FAIRLY UNIMPORTANT

NEITHER IMPORTANT NOR UNIMPORTANT

FAIRLY IMPORTANT

VERY IMPORTANT

SHOW CARD 3

NEVER

RARELY

SOMETIMES

OFTEN

SHOW CARD 3

OFTEN

SOMETIMES

RARELY

NEVER

SHOW CARD 5

OVERLOOKING IT

WITHIN ¼ MILE

¼ MILE UP TO 1 MILE

1 MILE – 5 MILES

6 MILES– 20 MILES

21 MILES – 50 MILES

51MILES – 100 MILES

OVER 100 MILES

SHOW CARD 5

OVER 100 MILES

51 MILES – 100 MILES

21 MILES – 50 MILES

6 MILES– 20 MILES

1 MILE – 5 MILES

¼ MILE UP TO 1 MILE

WITHIN ¼ MILE

OVERLOOKING IT

SHOW CARD 6

100+ TIMES A YEAR/TWICE A WEEK OR MORE

ABOUT 50 TIMES A YEAR/ONCE A WEEK

ABOUT 25 TIMES A YEAR/ONCE A FORTNIGHT

ABOUT 12 TIMES A YEAR/ONCE A MONTH

ABOUT 6 TIMES A YEAR/ONCE EVERY OTHER MONTH

ABOUT 3-4 TIMES A YEAR

ONCE OR TWICE A YEAR

NEVER

SHOW CARD 6

100+ TIMES A YEAR/TWICE A WEEK OR MORE

ABOUT 50 TIMES A YEAR/ONCE A WEEK

ABOUT 25 TIMES A YEAR/ONCE A FORTNIGHT

ABOUT 12 TIMES A YEAR/ONCE A MONTH

ABOUT 6 TIMES A YEAR/ONCE EVERY OTHER MONTH

ABOUT 3-4 TIMES A YEAR

ONCE OR TWICE A YEAR

NEVER

SHOW CARD 7

NEVER

OCCASIONALLY

USUALLY

ALWAYS

SHOW CARD 7

ALWAYS

USUALLY

OCCASIONALLY

NEVER

SHOW CARD 8

Poor/bad: (a lot of litter, usually smelly, sewage, no fish, little or no vegetation)

FAIR: (SOME LITTER, RARELY SMELLS, SOME FISH, SOME VEGETATION)

REASONABLE

GOOD: (LITTLE OR NO POLLUTION, CLEAR, MANY FISH, GOOD VEGETATION)

VERY GOOD

SHOW CARD 8

VERY GOOD

GOOD: (LITTLE OR NO POLLUTION, CLEAR, MANY FISH, GOOD VEGETATION)

REASONABLE

FAIR: (SOME LITTER, RARELY SMELLS, SOME FISH, SOME VEGETATION)

Poor/bad: (a lot of litter, usually smelly, sewage, no fish, little or no vegetation)

SHOW CARD 9

I HAVE NEVER SEEN ANY FISH ALIVE IN THE WATER

I HAVE SEEN FISH IN THE WATER

THERE ARE SOMETIMES A FEW ANGLERS THERE

THERE ARE SOMETIMES MANY ANGLERS THERE

I HAVE NEVER THOUGHT ABOUT THE FISH IN THE WATER

I KNOW THAT IT IS STOCKED WITH FISH

I HAVE SEEN DEAD FISH THERE

SHOW CARD 9

I HAVE SEEN DEAD FISH THERE

I KNOW THAT IT IS STOCKED WITH FISH

I HAVE NEVER THOUGHT ABOUT THE FISH IN THE WATER

THERE ARE SOMETIMES MANY ANGLERS THERE

THERE ARE SOMETIMES A FEW ANGLERS THERE

I HAVE SEEN FISH IN THE WATER

I HAVE NEVER SEEN ANY FISH ALIVE IN THE WATER

SHOW CARD 10

NONE

POOR (ONLY A FEW AND SMALL SIZE)

REASONABLE (REASONABLE NUMBER & SIZE)

GOOD (MANY AND LARGE)

SOME FISH, BUT NO IDEA HOW MANY

SHOW CARD 10

SOME FISH, BUT NO IDEA HOW MANY

GOOD (MANY AND LARGE)

NONE

REASONABLE (REASONABLE NUMBER & SIZE)
POOR (ONLY A FEW AND SMALL SIZE)

SHOW CARD 11

NOT AT ALL

A LITTLE

A FAIR AMOUNT

A LOT

DEPENDS

SHOW CARD 11

DEPENDS

A LOT

A FAIR AMOUNT

A LITTLE

NOT AT ALL

SHOW CARD 12

NOT AT ALL

A LITTLE

A FAIR AMOUNT

A LOT

SHOW CARD 12

A LOT

A FAIR AMOUNT

A LITTLE

NOT AT ALL

SHOW CARD 13

THROUGH A TRUST FUND (IE. A FUND SET UP SPECIALLY FOR THE SCHEME)

THROUGH HOUSEHOLD WATER BILLS

THROUGH THE COUNCIL TAX

THROUGH GENERAL TAXES

NONE OF THESE

SHOW CARD 13

NONE OF THESE

THROUGH GENERAL TAXES

THROUGH THE COUNCIL TAX

THROUGH HOUSEHOLD WATER BILLS

THROUGH A TRUST FUND (IE. A FUND SET UP SPECIALLY FOR THE SCHEME)

SHOW CARD 14

10P
25P
50P
£1
£2
£5
£7.50
£10
£15
£20
£25
£30
£40
£50
£75
£100
£150
£200

SHOW CARD 14

£200
£150
£100
£75
£50
£40
£30
£25
£20
£15
£10
£7.50
£5
£2
£1
50P
25P
10P

SHOW CARD 16

NOT AT ALL

A LITTLE

A FAIR AMOUNT

A LOT

SHOW CARD 16

A LOT

A FAIR AMOUNT

A LITTLE

NOT AT ALL

SHOW CARD 17

THROUGH A TRUST FUND (IE. A FUND SET UP SPECIALLY FOR THE SCHEME)

THROUGH HOUSEHOLD WATER BILLS

THROUGH THE COUNCIL TAX

THROUGH GENERAL TAXES

NONE OF THESE

SHOW CARD 17

NONE OF THESE

THROUGH GENERAL TAXES

THROUGH THE COUNCIL TAX

THROUGH HOUSEHOLD WATER BILLS

THROUGH A TRUST FUND (IE. A FUND SET UP SPECIALLY FOR THE SCHEME)

SHOW CARD 18

HAVE REGULARLY GONE FISHING IN THE PAST BUT NO LONGER DO SO

HAVE OCCASIONALLY GONE FISHING IN THE PAST BUT NO LONGER DO SO

CURRENTLY GO FISHING

DO NOT CURRENTLY GO FISHING, BUT DID SO IN THE PAST AND MAY DO SO AGAIN IN THE FUTURE

DO NOT CURRENTLY GO FISHING BUT MAY DO SO IN THE FUTURE

NONE OF THE ABOVE

SHOW CARD 18

HAVE REGULARLY GONE FISHING IN THE PAST BUT NO LONGER DO SO

HAVE OCCASIONALLY GONE FISHING IN THE PAST BUT NO LONGER DO SO

CURRENTLY GO FISHING

DO NOT CURRENTLY GO FISHING, BUT DID SO IN THE PAST AND MAY DO SO AGAIN IN THE FUTURE

DO NOT CURRENTLY GO FISHING BUT MAY DO SO IN THE FUTURE

NONE OF THE ABOVE

SHOW CARD 19

OVERLOOKING IT

WITHIN ¼ MILE

¼ MILE UP TO 1 MILE

1 MILE – 5 MILES

6 MILES– 20 MILES

21 MILES – 50 MILES

51MILES – 100 MILES

OVER 100 MILES

SHOW CARD 19

OVER 100 MILES

51 MILES – 100 MILES

21 MILES – 50 MILES

6 MILES– 20 MILES

1 MILE – 5 MILES

¼ MILE UP TO 1 MILE

WITHIN ¼ MILE

OVERLOOKING IT

SHOW CARD 20

NO FORMAL QUALIFICATIONS

O LEVEL/GCSE OR EQUIVALENT

A LEVEL OR EQUIVALENT

DEGREE OR EQUIVALENT

PROFESSIONAL OR EQUIVALENT

SHOW CARD 20

PROFESSIONAL OR EQUIVALENT

DEGREE OR EQUIVALENT

A LEVEL OR EQUIVALENT

O LEVEL/GCSE OR EQUIVALENT

NO FORMAL QUALIFICATIONS

SHOW CARD 21

J - LESS THAN £5,000 A YEAR

P - £5,000 - £9,999 A YEAR

M - £10,000 - £14,999 A YEAR

S - £15,000 - £24,999 A YEAR

K - £25,000 - £39,999 A YEAR

R - £40,000 - £60,000 A YEAR

T – OVER £60,000 A YEAR

SHOW CARD 21

T – OVER £60,000 A YEAR

R - £40,000 - £60,000 A YEAR

K - £25,000 - £39,999 A YEAR

S - £15,000 - £24,999 A YEAR

M - £10,000 - £14,999 A YEAR

P - £5,000 - £9,999 A YEAR

J - LESS THAN £5,000 A YEAR

Appendix C References

Adamowicz, W.L., Garrod, G. and Willis, K.G. (1995) Estimating the Passive Use Benefits of Britain's Inland Waterways. Research Report, Centre for Rural Economy, University of Newcastle, Newcastle upon Tyne, UK.

Anderson, R.W. (1975) Estimating the Recreational Benefits from Large Inland Reservoirs in Recreational Economics and Analysis ed Searle, G. Longman, Harlow

Andreoni J, (1990) Impure altruism and donations to public goods: A theory of warm-glow giving, Economic Journal, 100.

Anon (1982) A Study of the Economic Value of Sporting Salmon Fishing in Three Areas of Scotland. Report prepared for the Department of Agriculture and Fisheries for Scotland. Tourism and Recreation Research Unit, Edinburgh University. 21pp.

Anon (1983) Countryside Sports and their Economic Significance. Report prepared for The Standing Conference on Countryside Sports. Cobham Resource Consultants, Oxford, England. 322pp.

Anon (1989) Economic Importance of Salmon Fishing and Netting in Scotland. Report prepared for the Scottish Tourist Board and the Highlands and Islands Development Board. Mackay Consultants, Inverness. 129pp.

Barde J., Pearce D.W.(eds.) (1991), Valuing the Environment: Six Case Studies, Earthscan, London

Bateman I., Langford I.H, Rasbash J. (1999), Willingness to Pay Question Format Effects in Contingent Valuation Studies, in Bateman and Willis (eds.) Valuing Environmental Preferences, Oxford University Press, Oxford.

Bateman I., Langford I.H., (1996), Non-users' Willingness to Pay for a National Park: An application and Critique of Contingent Valuation Method, Regional Studies, Vol. 31.6 pp 571-582.

Bateman I., Langford I.H., Turner k., Willis K.G., Garrod G.D., (1995) Elicitation and truncation effects in contingent valuation, Ecological Economics, 12, pp161-179.

Bateman I., Turner K., (1993), Valuation of the Environment, Methods and Techniques: The Contingent Valuation Method, in Turner (eds.) Sustainable Environmental Economics and Management, Wiley&Son

Bateman I.J., Langford I.H., (1997), Budget Constraint and, temporal and question-ordering effects contingent valuation studies, Regional Studies, pp 1215-1228, vol. 29.

Bateman, I., Garrod, G. and Willis, K. (1993) An Introduction to the Estimation of the Benefits of Non-Priced Recreation Using the Travel Cost Method. Countryside Change Working Paper No 36. University of Newcastle.

Bateman, I., Garrod, G. and Willis, K. (1993b) Consistency Between Contingent Valuation Estimates: A Comparison of Two Studies of UK National Parks. Countryside Change Working Paper No 40. University of Newcastle

Bateman, I. and Langford (1996) Non Users' Willingness to Pay for a National Park: An application and Critique of the Contingent Valuation Method. Regional Studies 31, 571-582

Bateman, I.J., Diamand, E., Langford, I.H. and Jones, A.P. (1996), Household Willingness to Pay and Farmers' Willingness to Accept Compensation for Establishing a Recreational Woodland. Journal of Environmental Planning and Management. 39(1): 21-43.

Begona A-F, Hanley N., Wright R., Douglas M., (1999), Estimating benefits of Agri-environmental policy: Econometric issues in open-ended contingent valuation studies, Journal of Environmental Planning and Management, vol. 42(1), pp 23-43.

Bennett, R., Tranter, R., Beard, N. and Jones, P, (1995). The Value of Footpath Provision in the Countryside: A Case Study of Public Access to Urban fringe Woodland. Journal of Environmental Planning and Management 38, 409-417.

Berman, M., Sharman, H. and Hongin K (1997). Estimating Net Benefits of Reallocation: Discrete Choice Models of Sport and Commercial Fishing. Marine Resource Economics 12 307-327.

Bilsby et al (1994) Cost benefit analysis: its role in Recreational Fisheries Development and Management

Bishop R., Welsh M., (1992), Existence values in benefit-cost analysis and damage assessment, Land Economics, vol. 68, pp 405-417.

Bishop R.C., Boyle K.J. and Welsh M.P. (1987) Toward total economic valuation of Great Lakes Fishery Resources. Transactions of the American Fisheries Society, 116, 339-345.

Bishop R.C., Heberlein T.A. and Kealy M.J. (1983) Contingent valuation of environmental assets: comparisons with a simulated market. Natural Resources Journal, July 1983, 620-633.

Bockstael, N.E., McConnell, K.E. and Strand, I.E. (1989) A Random Utility Model for Sportfishing: Some Preliminary Results for Florida. Marine Resource Economics 6 245-260

Boyle K.J., Bishop R.C. and Welsh M.P. (1985) Starting point bias in contingent valuation bidding games. Land Economics, 61(2), 188-194.

Brookshire D.S., Randall A. and Stoll J.R. (1980) Valuing increments and decrements in natural resource service flows. American Journal of Agricultural Economics, 1980, 478-488.

Brookshire D.S., Thayer M.A., Schulze W.D. and d'Arge R.C. (1982) Valuing public goods: a comparison of survey and hedonic approaches. American Economic Review, 72(1), 165-177.

Brown T.C.(1984) The Concept of Value in Resource Allocation. Land Economics, 60, 231-246.

Brown, W.G. and Nawas, F.(1973) Impact of Aggregation on the Estimation of Outdoor Receation Demand Functions. American Journal of Agricultural Economics. Vol 55(2)246-249.

Carson et.al. (2000), Modelling Uncertainty in Distinguishing Between Respondent Types in Contingent Valuation Surveys, Paper presented at AERE 2000 in Crete.

Clawson (1959). Methods of Measuring the Demand for and the Value of Outdoor Recreation. Resources f or the Future Reprint No 10, Washington 1959.

Cobham Resource Consultants (1983) Countryside Sports and Their Economic Significance. The Standing Conference on Countryside Sports 1983

Cobham Resource Consultants (1992) Countryside Sports and Their Economic Significance. The Standing Conference on Countryside Sports 1992

Connelly, N. and Brown T.L. (1991). Net Economic Value of the Freshwater Recreational Fisheries of New York. Transactions of the American Fisheries Society, 120 770-775.

Copes, P. and Knetsch, J.L. (1981) Recreational Fisheries Analysis: Management Modes and Benefit Implications. Canadian Journal of Fisheries and Aquatic Sciences 38, 559-570

Cummings R.G., Harrison G.W. (1995), The measurement and Decomposition of Non Use Value: A Critical Review, Environmental and Resource Economics, 5, pp225-47.

Currie, J.M., Murphy, J.A. and Schmitz, A. (1971) The Concept of Economic Surplus in Economic Analysis. Economic Journal 81, 741-799.

Davis, J. and O'Neill C.O. (1992) Discrete Choice Valuation of Recreational Angling in Northern Ireland. Journal of Agricultural Economics, 3 452-457.

Daubert, J and Young, R. (1981) Recreational Demands for Maintaining Instream Flows. American Journal of Agricultural Economics, 63, 667-676.

Diamond P., Hausman J., (1994), Contingent Valuation: Is some number better than no number?, Journal of Economic Perspectives, vol. 8, pp 45-64.

Dunn, M.R., Potten, S.D., Radford, A.F. and Whitmarsh, D.W. (1989) An Economic Appraisal of the Bass Fishery in England and Wales. Centre for the Economics and Management of Aquatic Resources Report 30, University of Portsmouth.

Dunn, M.R., Potten, S.D. and Whitmarsh, D.W. (1995) Further Economic Evaluation of the Bass Fishery in England and Wales. Centre for the Economics and Management of Aquatic Resources Report 30, University of Portsmouth.

Ecotec (1994) An evaluation of the Benefits of Reduced Sulphur Dioxide Emissions. A Report to the Department of the Environment. Ecotech research and Consulting, Birmingham

Edwards S.F. and Anderson G.D. (1987) Overlooked Biases in Contingent Valuation Surveys: Some Considerations. Land Economics, 63, 168-178.

Environment Agency (1994) National Angling Survey 1994

Environment Agency (1998) Methodology to Assess Environmental Benefits of Alleviating Low Flow Rivers. Environment Agency March 1998.

Farber S (1988) The Value of Coastal Wetlands for Recreation: An Application of Travel Cost and Contingent Valuation Methodologies. Journal of Environmental Management 26 299-312.

Farizo, B.A., Hanley, N. and Wright, R. (1999), Estimating the Benefits of Agri-Environmental Policy: Econometric Issues in Open-ended Contingent Valuation Studies. Journal of Environmental Planning and Management 42, 23-43.

Foundation for Water Research (1996) Assessing the Benefits of Surface Water Quality Improvements: Manual, Marlow, Bucks.

Flegg A.T. (1976) Methodological Problems in Estimating Recreational Demand Functions and Evaluating Recreational Benefits. Regional Studies, 10, 353-362.

Foster, V., Bateman, I.J. and Harley, D (1997) Real and Hypothetical Willingness to Pay for Envrironmental Preservation: A Non-Experimental Comparison. Journal of Agricultural Economics 48, 123-138.

Foundation for Water Research 1996. Assessing the benefits of surface water quality improvements.

Freeman, A. M. (1995) The Benefits of Water Quality Improvements for Marine Recreation: A Review of the Empirical Evidence. Marine Resource Economics 10, 385-406.

Garrod, G and Willis, K. (1996) Estimating the Benefits of Environmental Enhancement: A Case Study of the River Darent. Journal of Environmental Planning and Management 39 189-203

Gee A.S. and Edwards R.W. (1982) Recreational Exploitation of the Atlantic Salmon in the River Wye. In: Allocation of Fishery Resources. Proceedings of the Technical Consultation, Vichy, France, 1980, (ed. by J.H. Grover), pp129-137. FAO/AFS.

Gibb Environment (1999) Economic Assessment of The River Lune Salmon Fishery. Gibb House, Reading.

Goodman, S.L., Seabrooke W. and Jaffry, S.A. (1998) Considering Conservation Value in Economic Appraisal of Coastal Resources. Journal of Environmental Planning and Management 41 313-336.

Gordon D., Chapman D.W. and Bjorn T.C. (1973) Economic Evaluations of Sport Fsheries - What Do They Mean? Transactions of the American Fisheries Society, 102, 293-311.

Green, C.H. and Tunstall, S.M. (1991) The Evaluation of River Water Quality Improvements by the Contingent Valuation Method Applied Economics 23 1135-1146

Green G., Moss C.B. and Spreen T. H. (1997) Demand for Recreational Fishing in Tampa Bay, Florida: A Random Utility Approach. Marine Resource Economics 12 293-305.

Greene H.W., (1997), Econometric Analysis, Third Edition, Prentice-Hall International Inc., New York.

Greenley D.A., Walsh R.G. and Young R.A. (1981) Option value: empirical evidence from a case study of recreation and water quality. Quarterly Journal of Economics, XCVI(4), 657-673.

Gregory R. (1986) Interpreting Measures of Economic Loss: Evidence from Contingent Valuation and Experimental Studies. Journal of Environmental Economics and Management, 13, 325-337.

Goodman, S.L., Seabrooke, W. and Jaffry, S.A. (1998). Considering Conservation Value in Economic Appraisal of Coastal Resource. Journal of Environmental Planning and Management 41, 313-336.

Hanley N.D. (1989) Valuing rural recreation benefits: an empirical comparison of two approaches. Journal of Agricultural Economics, 40, 361-372.

Harris B.S. 1984. Contingent Valuation of Water Pollution Control. Journal of Environmental Management, 19, 199-208.

Harris G.S. (1988) The Status of Exploitation of Salmon in England and Wales. In: Atlantic Salmon: Planning for the Future. Proceedings of the Third International Atlantic Salmon Symposium, Biarritz, France, 21-23 October 1986, (ed. by D.H. Mills and D. Piggins), pp69-90. Croom Helm, London.

Hausman J.(eds.), (1993), Contingent Valuation: A Critical Assessment, Elsevier Amsterdam.

Hoehn J.P., Randall A., (1987), A satisfactory benefit cost indicator from contingent valuation, Journal of Environmental Economics and Management, vol. 14, pp 226-247.

Hutchinson, W.G., Chilton, S.M. and Davis J. (1995) Measuring Non-Use Value of Environmental Goods Using the Contingent Valuation Method: Problems of Information and Cognition and the Application of Cognitive Questionnaire Design Methods. Journal of Agricultural Economics 46. 97-112

Johnston J, DiNardo J.,(1997) Econometric Methods, Fourth Edition, McGraw Hill International.

Kahneman D., Knetsch J., (1992), Valuing Public Goods: The purchase of Moral Satisfaction, Journal of Environmental Economics and Management, 22, pp 57-70.

Kealy M., Montgomery M., Dovidio (1990), Reliability and predictive validity of contingent values: does the nature of the good matter? Journal of Environmental Economics and Management, vol. 22, pp 244-263.

Kristrom B., (1997), Spike Models in Contingent Valuation, American Journal of Agricultural Economics, vol.79, pp 1013-1023.

Lewis R.C. and Whitby M.C. (1972) Recreation Benefits from a Reservoir. University of Newcastle-upon-Tyne, Agricultural Adjustment Unit. Research Monograph no.2. 51p.

Lewis, J.H. (1988) "Economic Impact Analysis: A U.K. Literature Survey and Bibliography" Progress in Planning Vol 30 pp 157-209.

Loomis J. (1987) The Economic Value of Instream Flow: Methodology and Benefit Estimates for Optimum Flows. Journal of Environmental Management, 24, 169-179.

Loomis J., Sorg C. and Donnelly D. (1986) Economic losses to recreational fisheries due to small-head hydro-power development: a case study of the Henry's Fork in Idaho. Journal of Environmental Management, 22, 85-94.

Loomis J., Gonzalez-Caban A., Gregory R., (1994) Do reminders of substitutes and budget constraints influence contingent valuation estimates? Land Economics, vol. 70(4), pp499-506.

Lund P.J. (1981) The Economic and Social Value of Salmon Fishing to the UK Economy in 1978. Presented at the Symposium on the Economic Evaluation of Salmon Fisheries, Fishmongers Hall, London, 1981. Atlantic Salmon Trust, Pitlochry, Scotland. 11pp.

Loomis J.B. (1989) Estimation of and Variation in Site Specific Marginal Values for Recreational Fisheries. Journal of Environmental Management 29 183-191.

Martin L.R. (1987) Economic impact analysis of a sport fishery on Lake Ontario: an appraisal of method. Transactions of the American Fisheries Society 116(3), 461-468.

Mawle G.W. (1983) Angling in South Wales. Department of Applied Biology, University of Wales Institute of Science and Technology. Research Report. 193pp.

Mawle G.W. and Randerson P.F. (1983) Economic aspects of recreational fishing in South Wales. In: Proceedings of the 3rd British Freshwater Fisheries Conference, 1983. pp142-154.

Middlesex University, Flood Hazard Research Centre (1994) Evaluation of the Use Value from Alleviating Low Flows National Rivers Authority R& D Note 258

Milon J.W., (1989), Contingent Valuation Experiment for Strategic Behaviour, Journal of Environmental Economics and Management vol. 17, pp 293-308.

MAFF (2000) Salmon and Freshwater Fisheries Review. London: Ministry of Agriculture, Fisheries and Food, PB 4602, 231pp.

Mitchell, R.C. and Carson R.T. (1989) Using Surveys to Value Public Goods: The Contingent Valuation Method. Resources for the Future, Washington, D.C.

Moon N and Souter, G. (1995) Socio- Economic Review of Angling 1994. Report to the National Rivers Authority, Bristol, R&D Project 501.

Morey E.R., Shaw W.D. and Rowe R.D. (1993). A Discrete Choice Model of Recreation Participation, Site Choice and Activity Valuation when Complete Trip Data are Not Available. Journal of Environmental Economics and Management 20 181-201.

National Oceanic and Atmospheric Administration (1993), Natural Resource Damage assessment Under the Oil Pollution Act of 1990. Federal Register 58 (10), 4601-4614.

Neil H., Cummings R., Ganderton P., Harrison G., McGuckin T., (1994), Hypothetical surveys and real economic commitments, Land Economics, vol. 70, pp 145-154.

O'Connor R. (1983) An Economic Evaluation of Salmon Fishing in Ireland in 1982. Presented to the South Western Regional Fisheries Board Seminar, Kenmore, Eire. 12pp.

O'Connor R., Whelan B.J. and McCashin A. (1974) An Economic Evaluation of Irish Salmon Fishing. Part II: The Irish Anglers. Publication series paper no. 75. The Economic and Social Research Institute, Dublin. 96pp.

O'Neill, C.E. and Davis (1991) Alternative Definitions of the Demand for Recreational Angling in Northern Ireland. Journal of Agricultural Economics 42, 174-179.

Perman, Ma, McGilvray, (1996), Natural Resource & Environmental Economics, Longman, London.

Pearce, Howarth, (2000) Technical Report on Methodology: Cost Benefit Analysis and Policy responses, part of the main report titled *European Environmental Priorities: an Integrated Economic and Environmental Assessment*, for the Environment Directorate-General of the European Commisssion.

Pearce D.W., Turner K., (1990) Economics of Natural Resources and the Environment, Harverster.

Propst D.B. and Gavrilis D.G. (1987) Role of economic impact assessment procedures in recreational fisheries management. Transactions of the American Fisheries Society, 116(3), 450-460.

Provencher, B. and Bishop, R.C. (1997) An Estimable Dynamic Model of Recreational Bahaviour with an Application to Great Lakes Angling. Journal of Environmental Economics and Management 33 107-127.

Radford A.F. (1980) Economic Survey of the River Wye Recreational Salmon Fishery. Centre for the Economics and Management of Aquatic Resources. Research Paper No 10, University of Portsmouth

Radford A.F. (1982) Estimating the Net Economic Yield of a Recreational Salmon Fishery: A Case Study of the River Wye. Centre for the Economics and Management of Aquatic Resources. Research Paper No 16 , University of Portsmouth

Radford A.F. (1984) The Economics and Value of Recreational Salmon Fisheries in England and Wales: An Analysis of the Rivers Wye, Mawddach, Tamar and Lune. Centre for the Economics and Management of Aquatic Resources. Report No 8 1984 University of Portsmouth

Radford A.F, Hatcher A and Whitmarsh D.W. (1991) An Economic Evaluation of Salmon Fisheries In Great Britain. Report prepared for the Ministry of Agriculture Fisheries and Food. Centre for the Economics and Management of Aquatic Resources. Report 16. University of Portsmouth.

Radford A F, Riddington G and Tingley D (2001) Economic Evaluation of Inland Fisheries. Project Record. Module A: Economic Evaluation of Fishing Rights. Environment Agency R&D Project Record W2-039/PR/1. Produced by MacAlister Elliott & Partners.

Radford A F, Spurgeon J, Riddington G, Colarullo G and Tingley D (2001) Economic Evaluation of Inland Fisheries. Technical Report. Module A: Economic Evaluation of Fishing Rights. Module B: Indirect Economic Values Associated with Fisheries. Environment Agency R&D Technical Report W2-039/TR/1. Produced by MacAlister Elliott & Partners.

Randall A. (1991), Total and Non-Use Values, in Braden J., Kolstad (eds.) Measuring the Demand for Environmental Quality, Elsevier Science Publishers, New York.

Randerson P.F., Edwards R.W. and Shaw K. (1978) An Economic Evaluation of Recreational Fishing in Three Areas in Wales. Presented at Recreational Freshwater Fisheries: Their Conservation, Management and Development, a Water Research Centre Conference. Session 4, paper 12.

Reiling S., Boyle K., Philips M., Anderson M., (1990), Temporal reliability and contingent values, Land Economics, pp 128-134, vol. 66.

Reiser B., Shechter M., (1999), Incorporating zero values in the economic valuation of environmental benefits, Envirometrics, vol. 10, pp 87-101.

Samples K.C. and Bishop R.C. (1985) Estimating the value of variations in anglers' success rates: an application of the multiple-site travel cost method. Marine Resource Economics, 2(1), 55-73.

Schadke D., Payne J., (1994), How people respond to contingent valuation questions: a verbal protocol analysis of willingness to pay for environmental regulation, Journal of Environmental Economics and Management, vol. 26, pp 88-109.

Shucksmith D.M. (1979) The demand for angling at the Derwent Reservoir, 1970-1976. Journal of Agricultural Economics, 30, 25-37.

Smith R.G. (1971) The Evaluation of Recreational Benefits: the Clawson Method in Practice. Urban Studies, 8, 89-102.

Smith R.G. and Kavanagh N.J. (1969) The Measurement of Benefits of Trout Fishing: Preliminary Results of a Study at Grafham Water, Great Ouse Water Authority, Huntingdonshire. Journal of Leisure Research, 1, 316-332.

Smith, R.J., Conrad, J.M. and Storey, D.A. (1979) An Economic Evaluation of Recreational Claming in Massachusetts. Massachusetts Agricultural Experimental Station Research Bulletin No. 654.

Smith V.K., Desvouges W.H. and Fisher A. (1986) A Comparison of Direct and Indirect Methods for Estimating Environmental Benefits. American Journal of Agricultural Economics, 68(2), 280-290.

Sorg, C.F. and Loomis J.B. (1986). Economic Value of Idaho Sport Fisheries with an Update on Valuation Techniques. North American Journal of Fisheries Management 6 494-503.

Spargo R.A. (1971) Evaluation of Sport Fisheries: An Experiment in Methods. Economics Branch, Fisheries Service, Department of the Environment, Ottawa, Canada.

Spurgeon, J., Radford, A.F. and Tingley, D. (1999) Economic Evaluation of Inland Fisheries. Case Study Reports: Thames, Teifi and Leeds. Environment Agency R&D Project. Produced by MacAlister Elliott.

Tapsell, S.M., Tunstall, S.M., Costa, P.L. and Fordham, M. (1992) Revenbourne River Queen's Mead Recreational Ground Survey, Final Report. Flood Hazard Research Centre, Middlesex University, Enfield

Usher A.J. (1987) Ontario Lake of the Woods Fishery: economic and social analysis. Transactions of the American Fisheries Society, 116, 352-366.

Vaughan W.J. and Russell C.S. (1982) Freshwater Recreational Fishing: The National Benefits of Water Pollution Control. Resources for the Future, John Hopkins Press.

Walsh R.G., Loomis J.B. and Gillman R.A. (1984) Valuing option, existence, and bequest demands for wilderness. Land Economics, 60(1), 14-29.

Walsh R.G., Ward F.A. and Olienyk J.P. (1989) Recreational demand for trees in National Forests. Journal of Environmental Management, 28, 255-268.

Whitmarsh, D., Northen, J. and Jaffry, S. (1999) Recreational Benefits of Coastal Protection: A case Study. Marine Policy 23, 453-463.

Willis K. (1990) Valuing Non-Market Commodities: An Evaluation and Comparison of Benefits and Costs. Applied Economics 22, 13-30,

Willis K. and Garrod G. (1991) Valuing Open Access Recreation of Inland Waterways: On-site Recreation Surveys and Selection Effects Regional Studies, 25 511-524

Willis, K., Garrod, G.D., Benson, J.F. and Carter, M. (1996). Benefits and Costs of the Wildlife Enhancement Scheme: A Case Study of the Penensey Levels. Journal of Environmental Planning and Management. 39 387-401

Willis K. and Garrod G. (1995) Benefits of Environmentally Sensitive Area Policy in England: A Contingent Valuation Assessment. Journal of Environmental Management 44, 105-125.

Willis K. and Garrod G. (1999). Angling and Recreational Values of Low-Flow Alleviation in Rivers Journal of Environmental Management 57 71-83

Whelan B.J. and Marsh G. (1988) An Economic Evaluation of Irish Angling. Report prepared for the Central Fisheries Board. The Economic and Social Research Institute, Dublin. 84pp.

Appendix D STATA Results

Anglers Survey

STATA results for Coarse Anglers

```
. probit  Payprinc   variety  income age

Iteration 0:   log likelihood = -385.93074
Iteration 1:   log likelihood = -369.27247
Iteration 2:   log likelihood = -369.20877
Iteration 3:   log likelihood = -369.20877

Probit estimates                          Number of obs   =        638
                                          LR chi2(3)      =      33.44
                                          Prob > chi2     =     0.0000
Log likelihood = -369.20877               Pseudo R2       =     0.0433

------------------------------------------------------------------------------
Payprinc|      Coef.   Std. Err.       z     P>|z|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  variety |  .1451845   .0446621     -3.251   0.001      -.2327206   -.0576483
  income |   .0457212   .0420879      1.086   0.277      -.0367696    .1282121
     age    |  -.2351594   .0498403     -4.718   0.000      -.3328446   -.1374741
   _cons |   1.397491   .2146277      6.511   0.000       .9768285    1.818154
------------------------------------------------------------------------------

regress   wtp age annexp waterqua permits valuefor

  Source |       SS       df       MS                    Number of obs =     605
---------+------------------------------                 F(  5,   599) =   28.81
   Model |  1971.66857     5  394.333714                  Prob > F      =  0.0000
Residual |  8197.65005   599  13.6855594                  R-squared     =  0.1939
---------+------------------------------                 Adj R-squared =  0.1872
   Total |  10169.3186   604  16.8366202                  Root MSE      =  3.6994

------------------------------------------------------------------------------
     wtp |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
     age |  -.3773021   .1361364     -2.772   0.006      -.6446647   -.1099394
  annexp |   .0003305   .0001363      2.424   0.016       .0000628    .0005983
waterqua |  .1982978    .144827     -1.369   0.171      -.4827282    .0861325
 permits |   .0511439    .026251      1.948   0.052      -.0004114    .1026992
valuefor |    .036711   .0034135     10.755   0.000       .0300072    .0434148
   _cons |   4.696369   .5354433      8.771   0.000       3.644795    5.747944
------------------------------------------------------------------------------
```

STATA Results for Salmon & Trout anglers

```
. probit  paymprin food sizeoffi class

Iteration 0:   log likelihood = -100.14778
Iteration 1:   log likelihood =  -92.23002
Iteration 2:   log likelihood = -92.089805
Iteration 3:   log likelihood = -92.089592

Probit estimates                  Number of obs   =        164
                                  LR chi2(3)      =      16.12
                                  Prob > chi2     =     0.0011
Log likelihood = -92.089592       Pseudo R2       =     0.0805

------------------------------------------------------------------------------
paymprin |      Coef.   Std. Err.       z     P>|z|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
    food |   .0250598   .0146111      1.715   0.086     -.0035774    .0536971
sizeoffi |   .2326565    .084708      2.747   0.006      .0666319     .398681
   class |  .224528   .1063733    -2.111   0.035     -.4330158   -.0160403
   _cons |   .2219969   .3806258      0.583   0.560     -.5240159    .9680097
------------------------------------------------------------------------------


regress   wtp class   var2 tripexp  valuefor

  Source |       SS       df       MS                  Number of obs =     160
---------+------------------------------                F(  4,   155) =   16.16
   Model |  1187.80433     4  296.951082                 Prob > F      =  0.0000
Residual |  2848.47341   155  18.3772478                R-squared     =  0.2943
---------+------------------------------                Adj R-squared =  0.2761
   Total |  4036.27773   159  25.3853946                Root MSE      =  4.2869

------------------------------------------------------------------------------
     wtp |      Coef.   Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
   class |  .3748475   .3490992    -1.074   0.285     -1.064454    .3147584
Permits |  -.0194446    .013353    -1.456   0.147     -.0458219    .0069328
 tripexp |   .0260741   .0093152      2.799   0.006      .0076729    .0444753
valuefor |   .0474227   .0073294      6.470   0.000      .0329443    .0619012
   _cons |   5.022526   1.006216      4.991   0.000      3.034859    7.010193
------------------------------------------------------------------------------
```

General Public Survey

STATA results for the nearest site

probit Payprin Seefish Edu

Iteration 0: log likelihood = -528.11253
Iteration 1: log likelihood = -464.37567
Iteration 2: log likelihood = -463.93566
Iteration 3: log likelihood = -463.9356

Probit estimates Number of obs = 763
LR chi2(2) = 128.35
Prob > chi2 = 0.0000
Log likelihood = -463.9356 Pseudo R2 = 0.1215

Paympri	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Seefish	.4997609	.0482728	10.353	0.000	.405148	.5943739
edu	.101932	.0334982	3.043	0.002	.0362769	.1675872
_cons	-1.418543	.1452459	-9.766	0.000	-1.70322	-1.133866

Log normal functional form

.regress lnwtp inc Env Fishstocked Prof

Source	SS	df	MS		
Model	35.64371	4	8.9109275		
Residual	282.515928	252	1.12109495		
Total	318.159638	256	1.24281109		

Number of obs = 257
F(4, 252) = 7.95
Prob > F = 0.0000
R-squared = 0.1120
Adj R-squared = 0.0979
Root MSE = 1.0588

lnwtp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
inc	.0009318	.0004563	2.042	0.042	.0000331	.0018305
Env	.253807	.067766	-3.745	0.000	-.3872668	-.120347
Fishstocked	.4356419	.1386866	3.141	0.002	.1625095	.7087743
Prof	.2409655	.1781467	1.353	0.177	-.1098805	.5918115
_cons	2.289529	.1872285	12.229	0.000	1.920797	2.658261

STATA results for the River Wye

probit paymprin edu Benefit

```
Iteration 0:   log likelihood = -541.30322
Iteration 1:   log likelihood = -507.33686
Iteration 2:   log likelihood = -507.30228
Iteration 3:   log likelihood = -507.30228

Probit estimates                  Number of obs   =        843
                                  LR chi2(2)      =      68.00
                                  Prob > chi2     =     0.0000
Log likelihood = -507.30228       Pseudo R2       =     0.0628

------------------------------------------------------------------------------
   paymprin|      Coef.   Std. Err.       z    P>|z|     [95% Conf. Interval]
-----------+------------------------------------------------------------------
         edu |   .0764755   .0316505     2.416   0.016      .0144417    .1385094
     Benefit |   .5908705    .077502    -7.624   0.000     -.7427716   -.4389693
       _cons |   .4358264   .1680469     2.593   0.010      .1064605    .7651922
------------------------------------------------------------------------------
```

Log normal functional form

regress lnwtp nonqualification Env Wildlife sex

```
      Source |       SS       df       MS              Number of obs =     252
-------------+------------------------------           F(  4,   247) =    8.23
       Model |  50.2167696     4  12.5541924           Prob > F      =  0.0000
    Residual |  376.972151   247  1.52620304           R-squared     =  0.1176
-------------+------------------------------           Adj R-squared =  0.1033
       Total |  427.188921   251  1.70194789           Root MSE      =  1.2354

------------------------------------------------------------------------------
       lnwtp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  noqualifi |  -.3249036   .2020373    -1.608   0.109     -.7228392     .073032
         Env |   .2739175    .084165    -3.255   0.001     -.4396902   -.1081448
    Wildlife |    .362655   .0977773     3.709   0.000      .1700713    .5552386
         Sex |  -.2545615   .1573198    -1.618   0.107      -.564421    .0552979
       _cons |   1.273294   .4002006     3.182   0.002      .4850527    2.061535
------------------------------------------------------------------------------
```